# CIS 4004: Web Based Information Technology
# Fall 2013

## JavaScript – Part 3

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# The Document Object Model

- The Document Object Model (DOM) for HTML5 represents a hierarchy tree.
- At the root of every web page or document is the `<html>` element, and the rest of the elements in the page are a branch somewhere along the tree.
- JavaScript uses the DOM for addressing and manipulation a web page beyond what you can do with HTML5 alone.
- The entire DOM tree is a representation of the document that resides in your computer's memory.

# The Document Object Model

- When any part of the DOM tree is addressed, it does so by referencing an element within the tree, beginning with `document`.
- Each element in the tree is addressed in order of the hierarchy beginning with `document`.
- The different elements in a web page are the different properties or methods (built-in functions) of the `document` separated by a dot ( **.** ).



# The Document Object Model

- For example, `document.forms.signup;` would address a form named `signup` within a document.
- A built-in function that does something with the document would appear as:

```
document.write("this is some text.");
```

- The `window` root along with the document has several built-in functions that are useful for manipulating viewing areas of a web page (more later). See the example markup on page 15 in the JavaScript – Part 2 notes to see a use of the `window` root.



# Viewing A Document's DOM Tree

- Current browsers provide developer tools that can display a visual representation of a document's DOM tree.
- The table on the next page illustrates how to access the developer tools for desktop versions of each of the major browsers.
- For the most part, the developer tools are very similar across the browsers.
- NOTE: For FireFox, you must first install the DOM Inspector add-on available at: https://addons/mozilla/org/en-US/firefox/addon/dom-inspector-6622/.

# Viewing A Document's DOM Tree

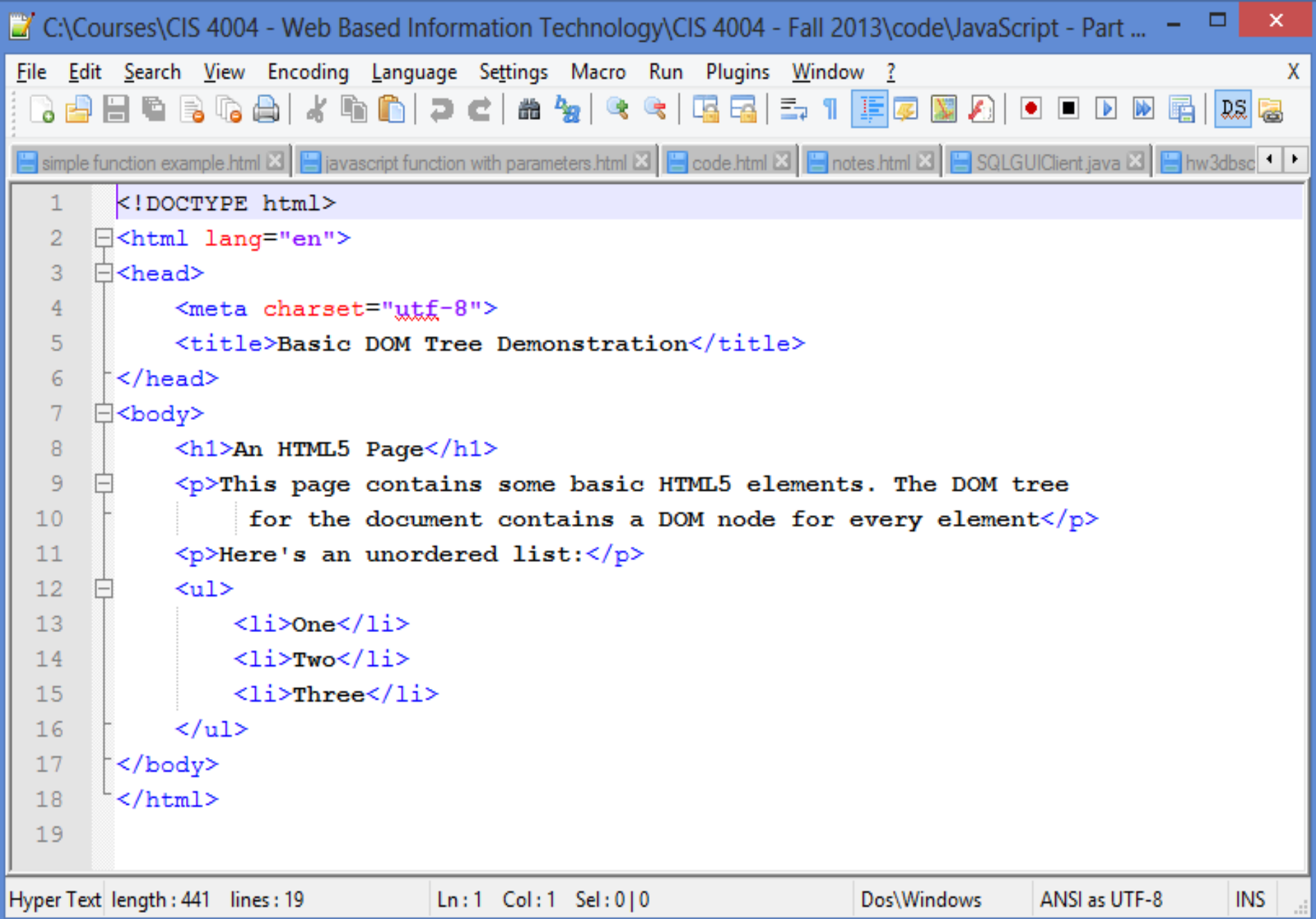
| Browser | Command to display developer tools |
|---|---|
| Chrome | Windows/Linux: *Control + Shift + i*<br>Mac OS X: *Command + Option + i* |
| Firefox | Windows/Linux: *Control + Shift + i*<br>Mac OS X: *Command + Option + i* |
| IE | *F12* |
| Opera | Windows/Linux/Mac OS X: From View on tool bar select Developer Tools then select Opera DragonFly (Control + Shift + i should also work) |
| Safari | Windows/Linux/Mac OS X: From Edit/Preferences/Advanced check "Show develop menu in menu bar" – then select as needed |

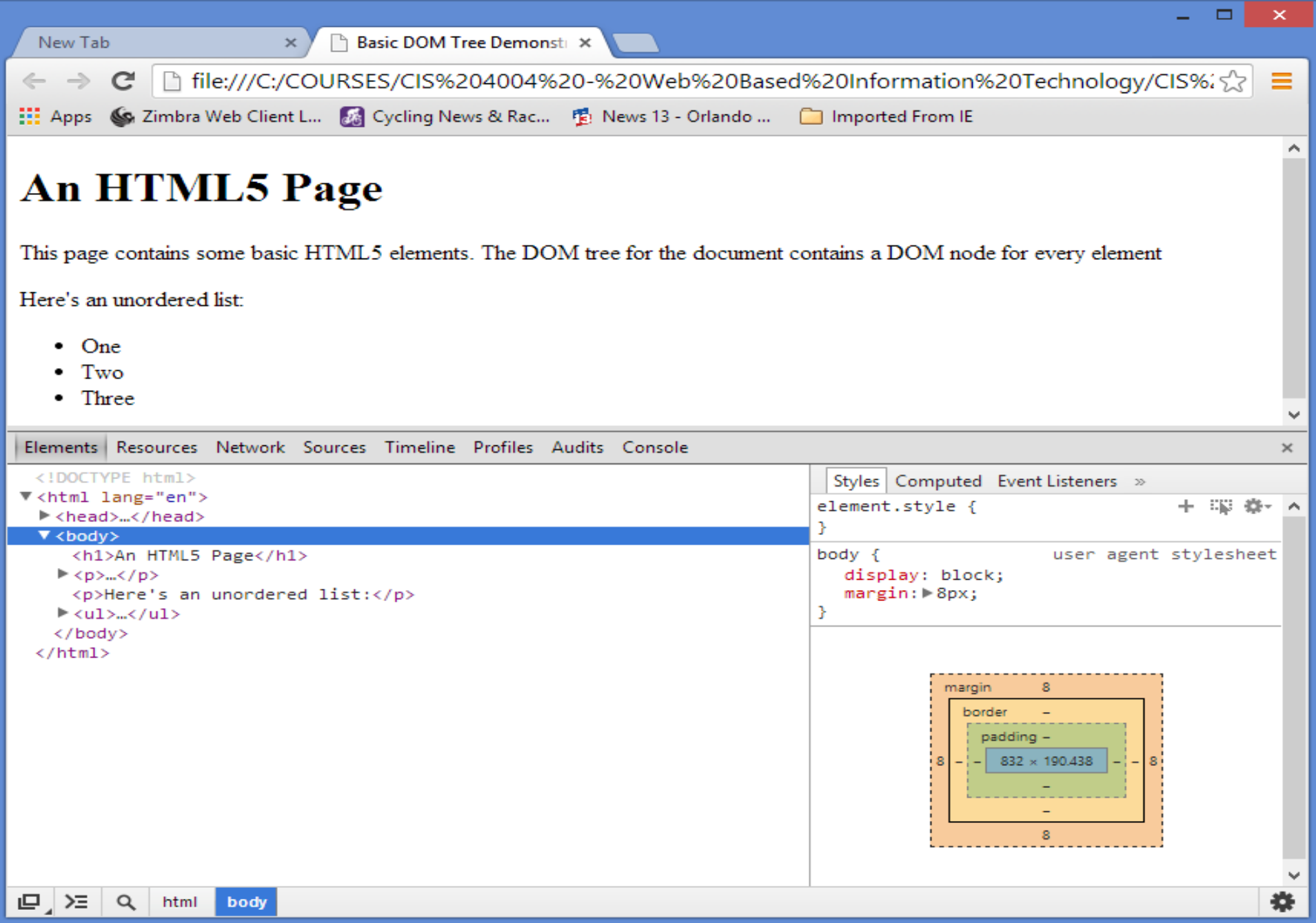


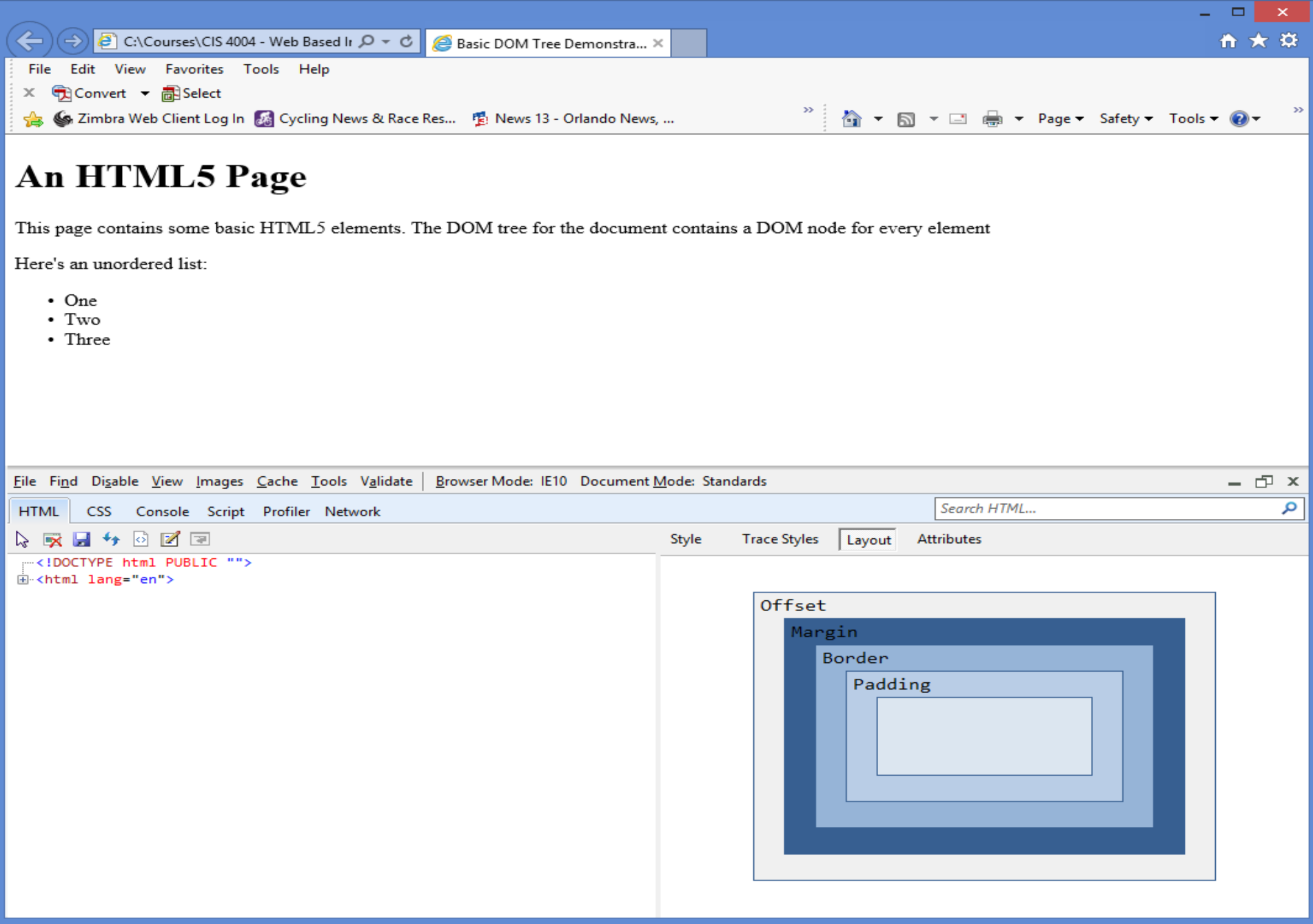
# Viewing A Document's DOM Tree

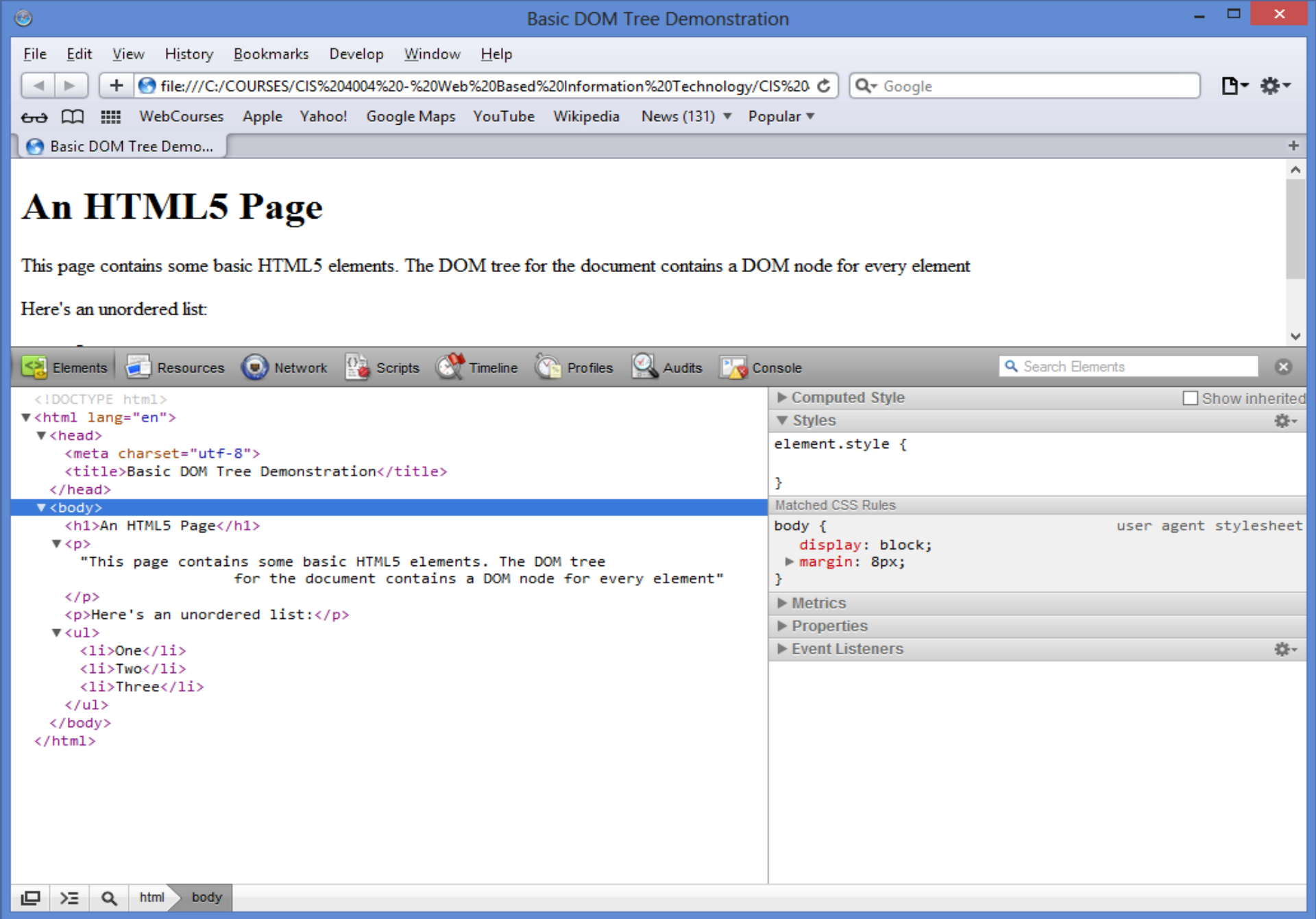
- We'll use the markup shown on the next page as an example to view the DOM tree in a couple of the browsers so that you can see what the developer tool looks like.
- The tool in Chrome is shown on page 9, the tool in IE is shown on page 10, the tool in Safari is shown on page 11, and the tool in Opera is shown on page 12.




C:\Courses\CIS 4004 - Web Based Information Technology\CIS 4004 - Fall 2013\code\JavaScript - Part ...
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
simple function example.html
javascript function with parameters.html
code.html
notes.html
SQLGUIClient.java
hw3dbsc
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Basic DOM Tree Demonstration</title>
</head>
<body>
<h1>An HTML5 Page</h1>
This page contains some basic HTML5 elements. The DOM tree
for the document contains a DOM node for every element
Here's an unordered list:
<ul>
<li>One</li>
<li>Two</li>
<li>Three</li>
</ul>
</body>
</html>
Hyper Text length : 441 lines : 19
Ln : 1 Col : 1 Sel : 0 | 0
Dos\Windows
ANSI as UTF-8
INS

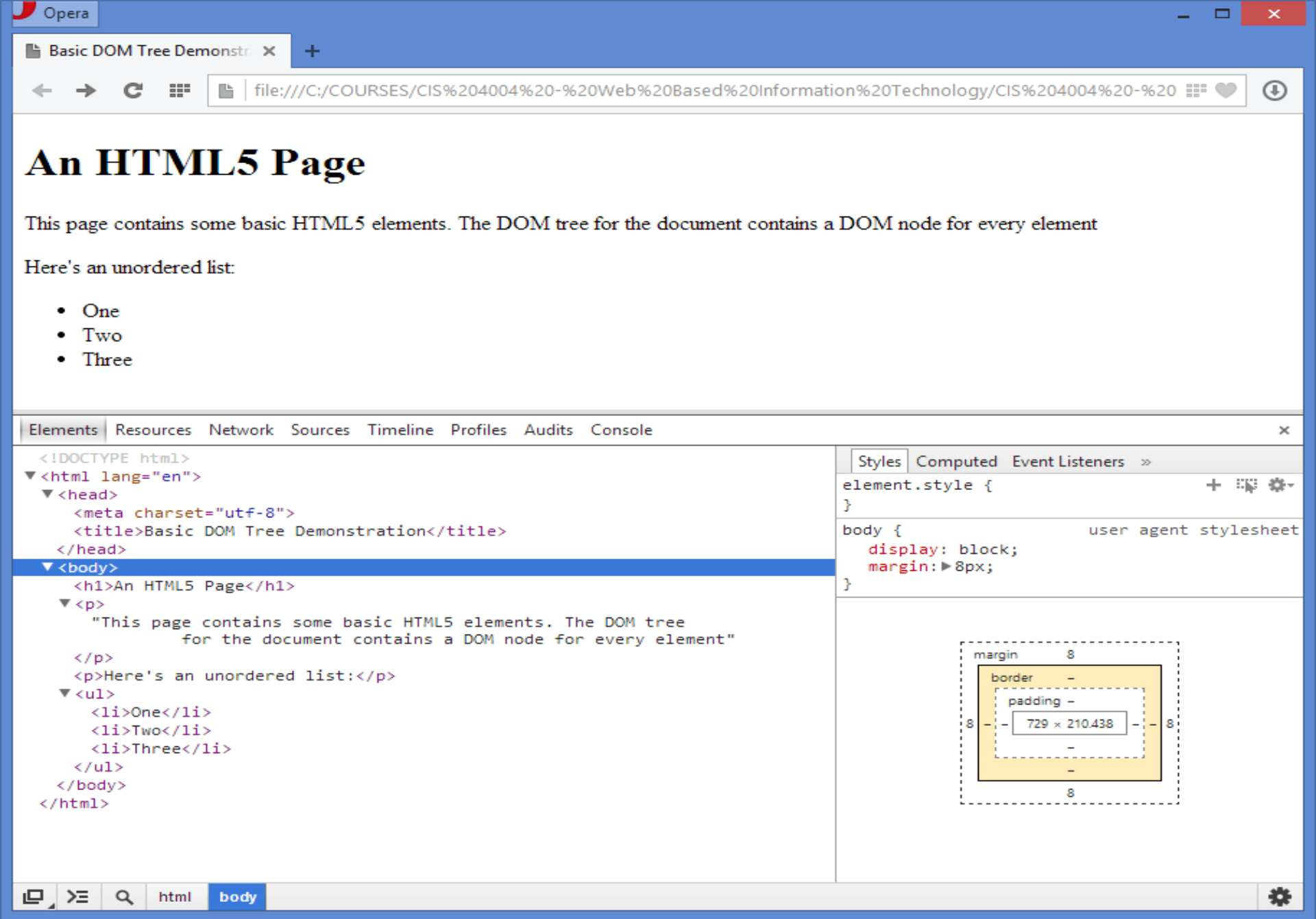

New Tab
Basic DOM Tree Demonst
file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technology/CIS%
Apps
Zimbra Web Client L...
Cycling News & Rac...
News 13 - Orlando ...
Imported From IE
An HTML5 Page
This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element
Here's an unordered list:
One
Two
Three
Elements
Resources
Network
Sources
Timeline
Profiles
Audits
Console
<!DOCTYPE html>
<html lang="en">
<head>…</head>
<body>
<h1>An HTML5 Page</h1>
…
Here's an unordered list:
<ul>…</ul>
</body>
</html>
Styles
Computed
Event Listeners
element.style {
}
body {
user agent stylesheet
display: block;
margin: 8px;
}
margin
8
border
padding
832 × 190.438
html
body


C:\Courses\CIS 4004 - Web Based I
Basic DOM Tree Demonstra...
File Edit View Favorites Tools Help
Convert Select
Zimbra Web Client Log In
Cycling News & Race Res...
News 13 - Orlando News, ...
Page Safety Tools
An HTML5 Page
This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element
Here's an unordered list:
One
Two
Three
File Find Disable View Images Cache Tools Validate Browser Mode: IE10 Document Mode: Standards
HTML CSS Console Script Profiler Network
Search HTML...
<!DOCTYPE html PUBLIC "">
<html lang="en">
Style Trace Styles Layout Attributes
Offset
Margin
Border
Padding


Basic DOM Tree Demonstration
File Edit View History Bookmarks Develop Window Help
file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technology/CIS%20
Google
WebCourses Apple Yahoo! Google Maps YouTube Wikipedia News (131) Popular
Basic DOM Tree Demo...
An HTML5 Page
This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element
Here's an unordered list:
Elements Resources Network Scripts Timeline Profiles Audits Console
Search Elements
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Basic DOM Tree Demonstration</title>
</head>
<body>
<h1>An HTML5 Page</h1>

"This page contains some basic HTML5 elements. The DOM tree
for the document contains a DOM node for every element"

Here's an unordered list:
<ul>
<li>One</li>
<li>Two</li>
<li>Three</li>
</ul>
</body>
</html>
Computed Style
Show inherited
Styles
element.style {
}
Matched CSS Rules
body { user agent stylesheet
display: block;
margin: 8px;
}
Metrics
Properties
Event Listeners
html body


Opera
Basic DOM Tree Demonstr
file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technology/CIS%204004%20-%20
An HTML5 Page
This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element
Here's an unordered list:
One
Two
Three
Elements Resources Network Sources Timeline Profiles Audits Console
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Basic DOM Tree Demonstration</title>
</head>
<body>
<h1>An HTML5 Page</h1>

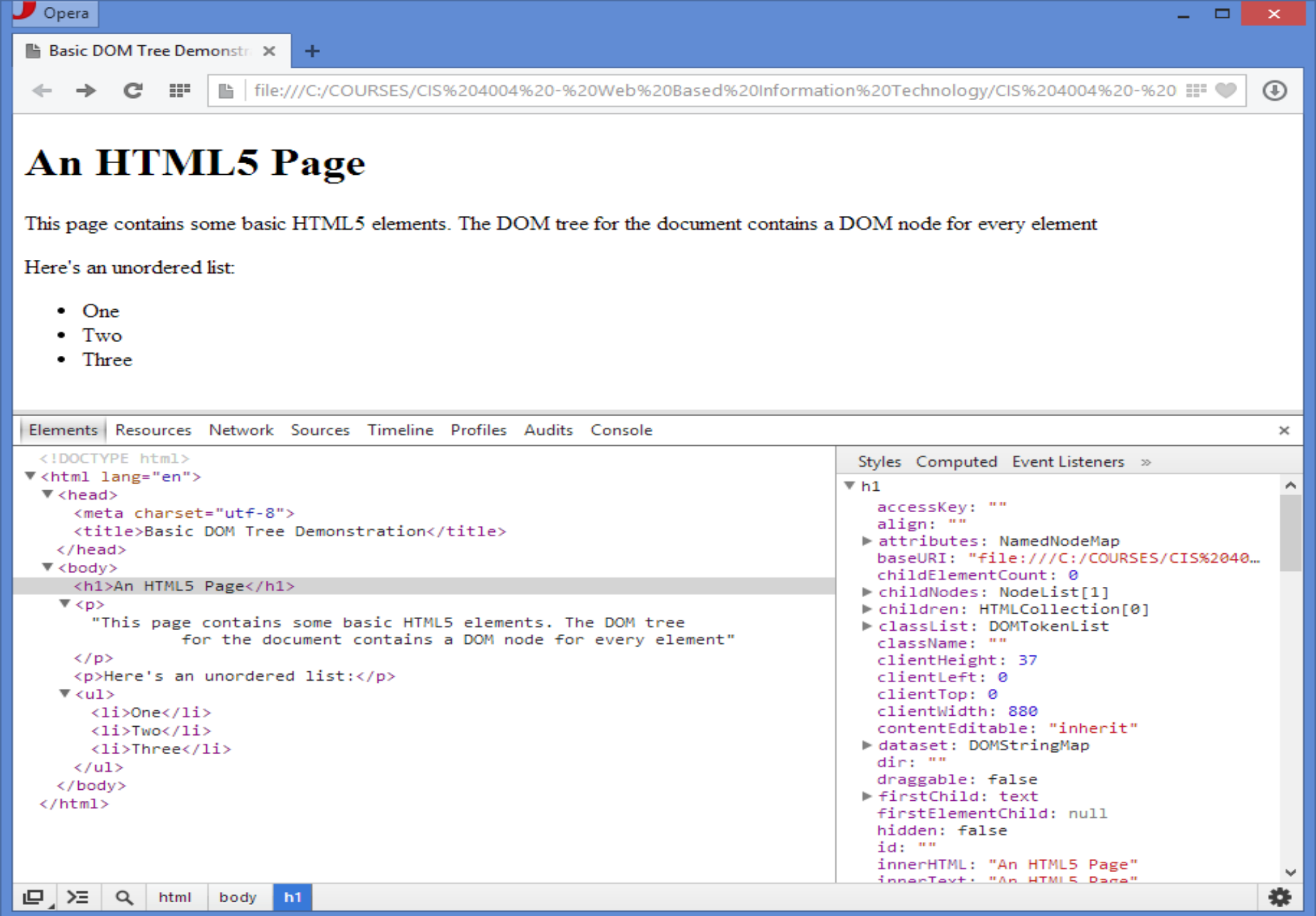
"This page contains some basic HTML5 elements. The DOM tree
for the document contains a DOM node for every element"

Here's an unordered list:
<ul>
<li>One</li>
<li>Two</li>
<li>Three</li>
</ul>
</body>
</html>
Styles Computed Event Listeners
element.style {
}
body { user agent stylesheet
display: block;
margin: 8px;
}
margin 8
border –
padding –
8
729 × 210.438
8
–
8
html body

# Viewing A Document's DOM Tree

- Let's focus for a bit on the tool as it appears in the Opera browser.
- A node in the DOM tree can be expanded and collapsed using the ▸ and ▾ arrows next to a given node. The screen shot on page 9 illustrates all nodes in the document fully expanded.
- The `html` node is the root of the tree since it has no parent. Notice in the screen shot on the next page, that if the cursor is placed on the html node, the entire document is highlighted in the top window.




Opera
Basic DOM Tree Demonstr
file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technology/CIS%204004%20-%20
An HTML5 Page
This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element
Here's an unordered list:
One
Two
Three
Elements Resources Network Sources Timeline Profiles Audits Console
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Basic DOM Tree Demonstration</title>
</head>
<body>
<h1>An HTML5 Page</h1>

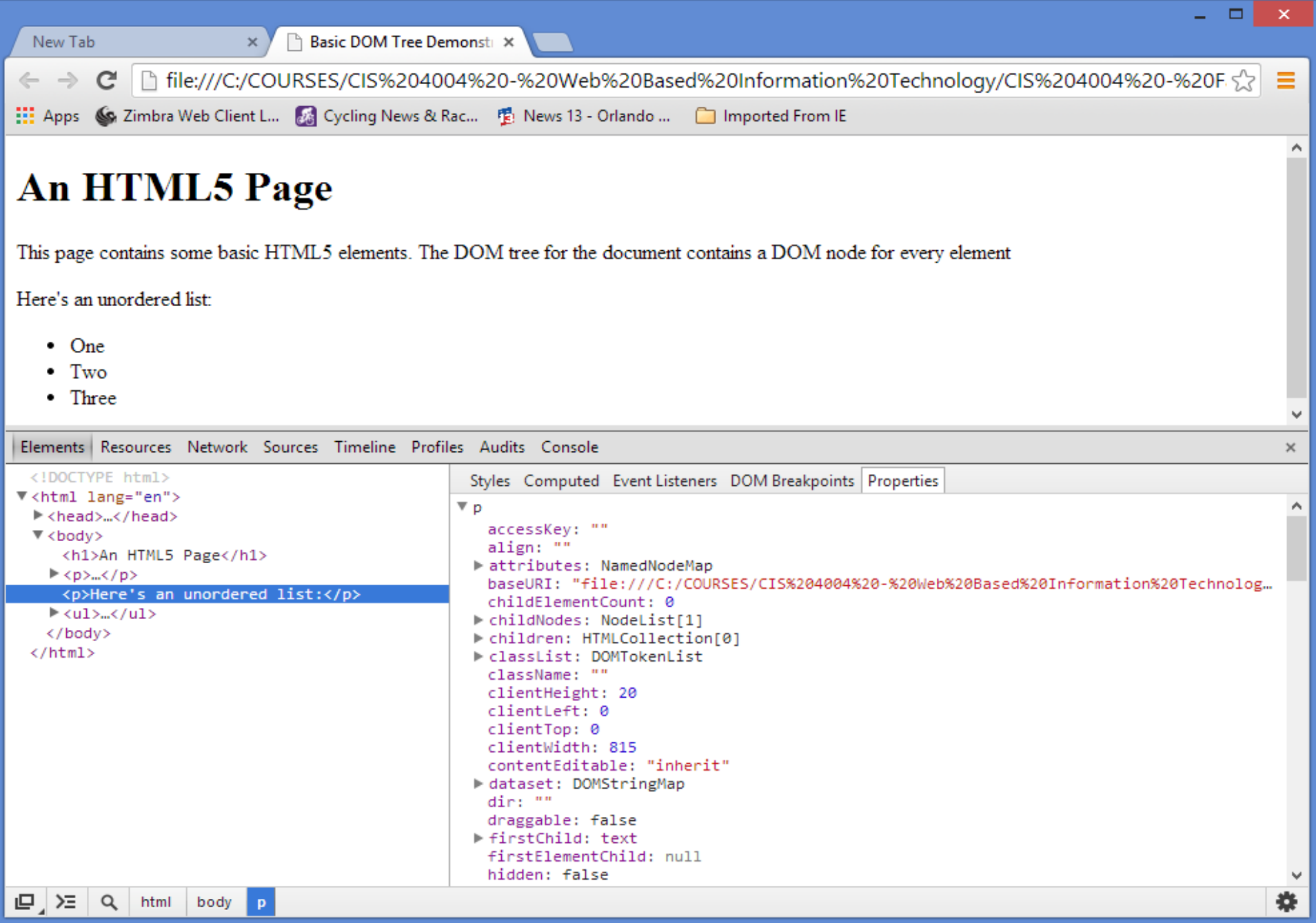
"This page contains some basic HTML5 elements. The DOM tree for the document contains a DOM node for every element"

Here's an unordered list:
<ul>
<li>One</li>
<li>Two</li>
<li>Three</li>
</ul>
</body>
</html>
Styles Computed Event Listeners
h1
accessKey: ""
align: ""
attributes: NamedNodeMap
baseURI: "file:///C:/COURSES/CIS%2040…
childElementCount: 0
childNodes: NodeList[1]
children: HTMLCollection[0]
classList: DOMTokenList
className: ""
clientHeight: 37
clientLeft: 0
clientTop: 0
clientWidth: 880
contentEditable: "inherit"
dataset: DOMStringMap
dir: ""
draggable: false
firstChild: text
firstElementChild: null
hidden: false
id: ""
innerHTML: "An HTML5 Page"
html
body
h1

# Viewing A Document's DOM Tree

- When you select a node in the left side of the developer's tools Elements tab, the node's details are displayed in the right side.
- On the next page, I've illustrated this by selecting the <p> element just before the start of the unordered list. In the Properties section (right pane) you can see the values for the <p> element.




New Tab
Basic DOM Tree Demonst
file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technology/CIS%204004%20-%20F
Apps
Zimbra Web Client L...
Cycling News & Rac...
News 13 - Orlando ...
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An HTML5 Page
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Timeline
Profiles
Audits
Console
<!DOCTYPE html>
<html lang="en">
<head>…</head>
<body>
<h1>An HTML5 Page</h1>
…
Here's an unordered list:
<ul>…</ul>
</body>
</html>
Styles
Computed
Event Listeners
DOM Breakpoints
Properties
p
accessKey: ""
align: ""
attributes: NamedNodeMap
baseURI: "file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20Technolog…
childElementCount: 0
childNodes: NodeList[1]
children: HTMLCollection[0]
classList: DOMTokenList
className: ""
clientHeight: 20
clientLeft: 0
clientTop: 0
clientWidth: 815
contentEditable: "inherit"
dataset: DOMStringMap
dir: ""
draggable: false
firstChild: text
firstElementChild: null
hidden: false
html
body
p

# Viewing A Document's DOM Tree

- In addition to viewing a document's DOM structure, the developer tools in each browser typically allow you to view and modify styles, view and debug JavaScripts used in the document, view the resources (such as images) used by the document, and so on.
- I would suggest that you become familiar with the developer tool in whichever browser you intend to use as your primary development environment.



# The Document Object Model

- To get a better sense of how the DOM works with your web page and JavaScript, it helps to see what can be done with a web page's windows – the viewing part of your web page.
- The following example shows how to load a new window from the current document, leaving the current page in place.



C:\Courses\CIS 4004 - Web Based Information Technology\CIS 4004 - Fall 2013\code\JavaScript - Part 3\PageOpener.html - Notepad...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?

code.html | notes.html | SQLGUIClient.java | hw3dbscript.sql | domtree.html | PageOpener.html

PageOpener.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title> Open Another Page </title>
    <meta charset="utf-8">
    <style type="text/css">
    <!--
        a {
            text-decoration:none;
            color:#cc0000;
            font-size:24px;
        }
        header {
            text-align:center;
        }
    -->
    </style>
</head>
<body>
    <header> <a href="#" onClick="someOtherWindow()">Click to Open New Window</a> </header>
    <script type="text/javascript">
        function someOtherWindow()
        {
            window.open("OtherWindow.html","ow","width=400,height=200");
        }
    </script>
</body>
</html>
```

Hyper Text Markup Language file | length : 524 lines : 29 | Ln : 1 Col : 1 Sel : 0 | 0 | UNIX | ANSI as UTF-8 | INS



C:\Courses\CIS 4004 - Web Based Information Technology\CIS 4004 - Fall 2013\code\JavaScript - Part 3\OtherWindow.html - Notepa...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?

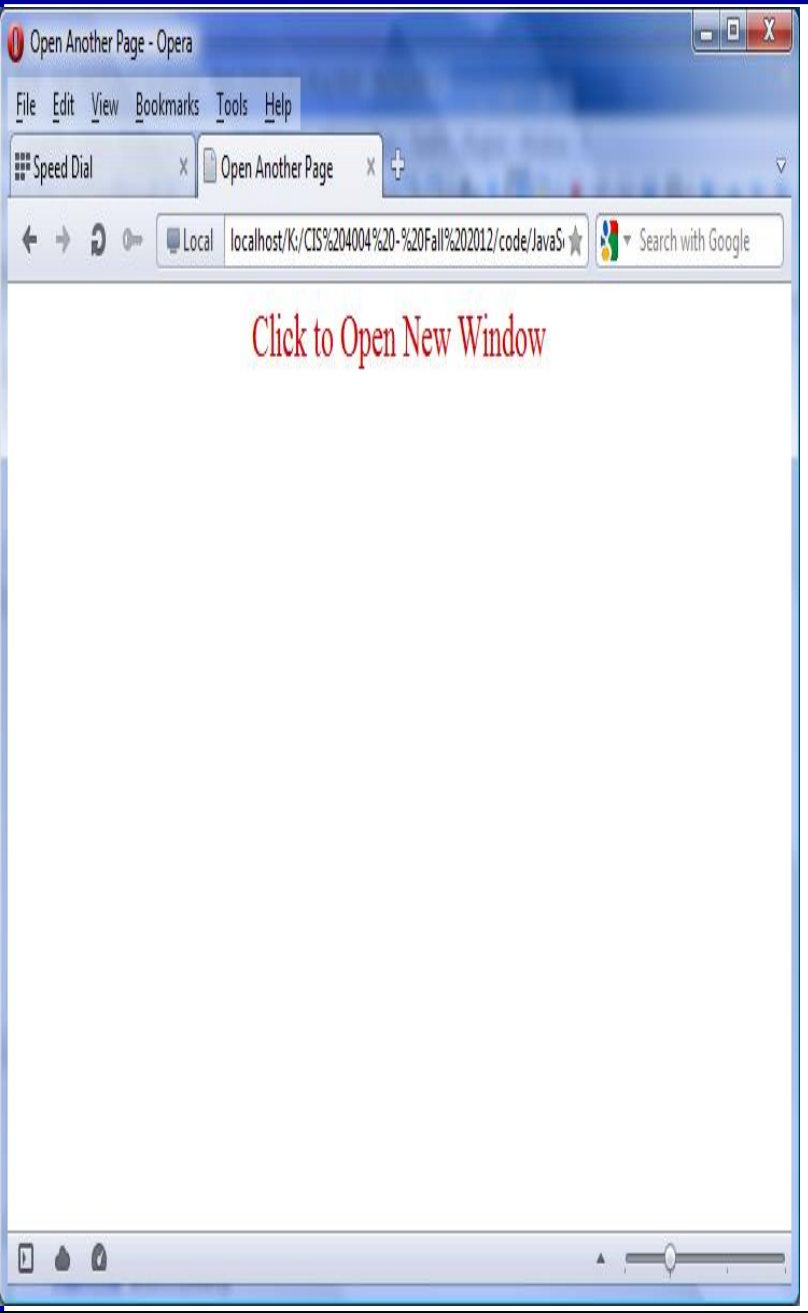
code.html | notes.html | SQLGUIClient.java | hw3dbscript.sql | domtree.html | PageOpener.html | OtherWindow.html

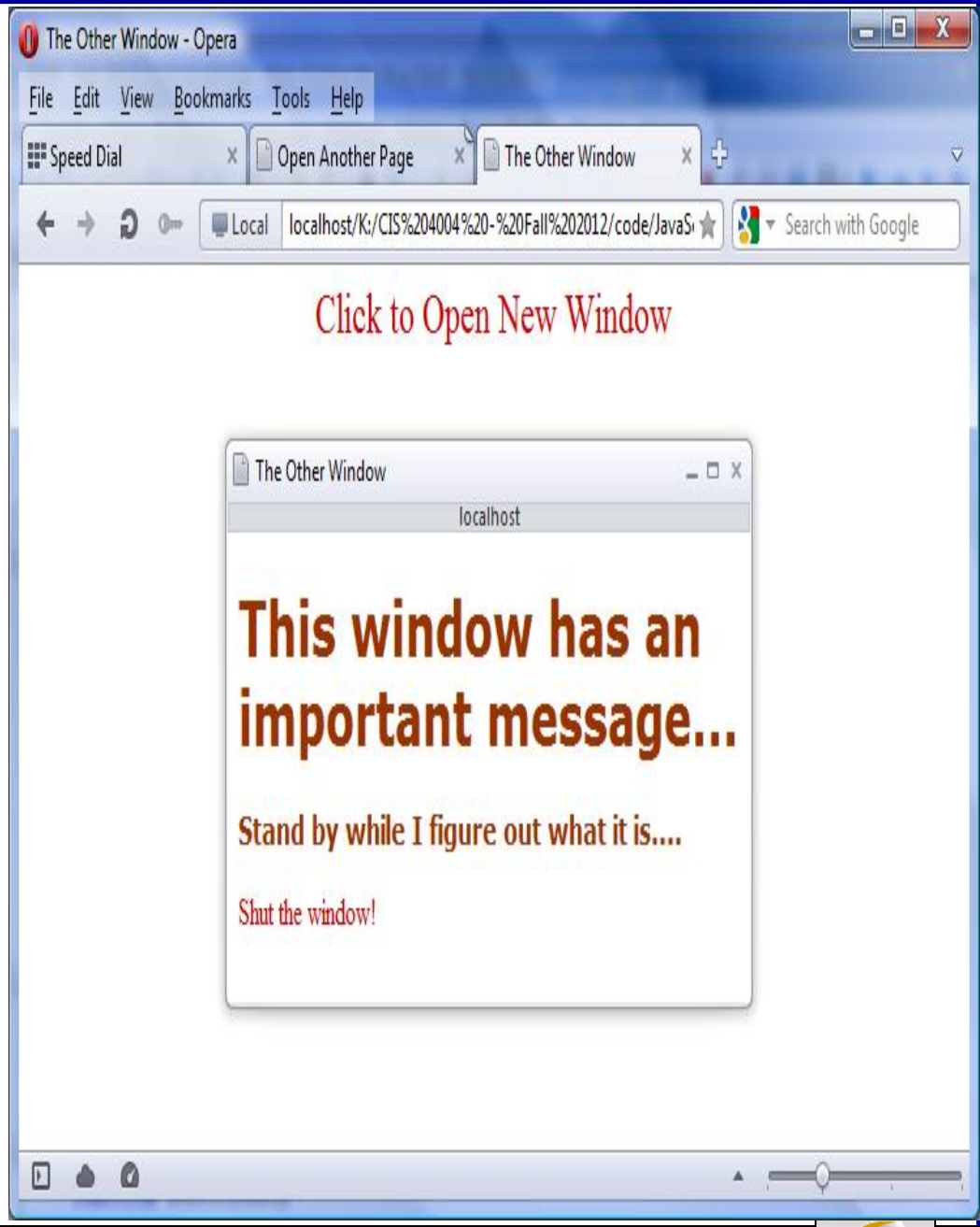
OtherWindow.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>The Other Window </title>
    <meta charset="utf-8">
    <style type="text/css">
    <!--
        h1,h4 {
            font-family:Verdana, Geneva, sans-serif;  color:#930;
        }
        a {
            text-decoration:none;  color:#cc0000; text-align:center;
        }
    -->
    </style>
</head>
<body>
    <h1>This window has an important message...</h1>
    <h4>Stand by while I figure out what it is....</h4>
    <a href="#" onClick="shutItDown()">Shut the window!</a>
    <script type="text/javascript">
    function shutItDown()
    {
        window.close();
    }
    </script>
</body>
</html>
```

Hyper Text Markup Language file | length : 567 lines : 29 | Ln : 1 Col : 16 Sel : 0 | 0 | UNIX | ANSI as UTF-8 | INS




Open Another Page - Opera
File Edit View Bookmarks Tools Help
Speed Dial
Open Another Page
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/JavaS
Search with Google
Click to Open New Window


The Other Window - Opera
File Edit View Bookmarks Tools Help
Speed Dial
Open Another Page
The Other Window
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/JavaS
Search with Google
Click to Open New Window
The Other Window
localhost
This window has an important message...
Stand by while I figure out what it is....
Shut the window!

# The Document Object Model

- Up to this point when we've written markup where one page is linked to another page, the current page has disappeared as soon as the user clicks the link to the other page.
- Now, using this little bit of JavaScript you can "talk" directly to the page and tell it you want a new window of a specified size to open while the current window stays open.



# HTML5 Elements And The DOM

- In order to give you an even better idea of how to work with the DOM in HTML5, certain new elements require DOM references within the tags themselves.
- One such new element is the `<output>` element. Currently, Opera is the only browser that has fully implemented this element, so again, you should test the following markup using Opera.
- When you use the `<output>` element, you can place the results of a calculation directly on the webpage. You don't have to build a JavaScript function or even a simple script.



# HTML5 Elements And The DOM

- However, the materials within an output element must follow the same DOM rules as with JavaScript.
- The output container doesn't require content between the opening and closing tags. However, all of the calculations must be within the `<output>` element itself.
- The `<output>` element works in conjunction with the `<form>` element and we've already covered that and your current project deals with that as well.
- Now we want to focus on the DOM structure in the `<output>` element's use. Consider the following markup.



*K:\CIS 4004 - Fall 2012\code\JavaScript - Part 2\shoppingOutput.html - Notepad++

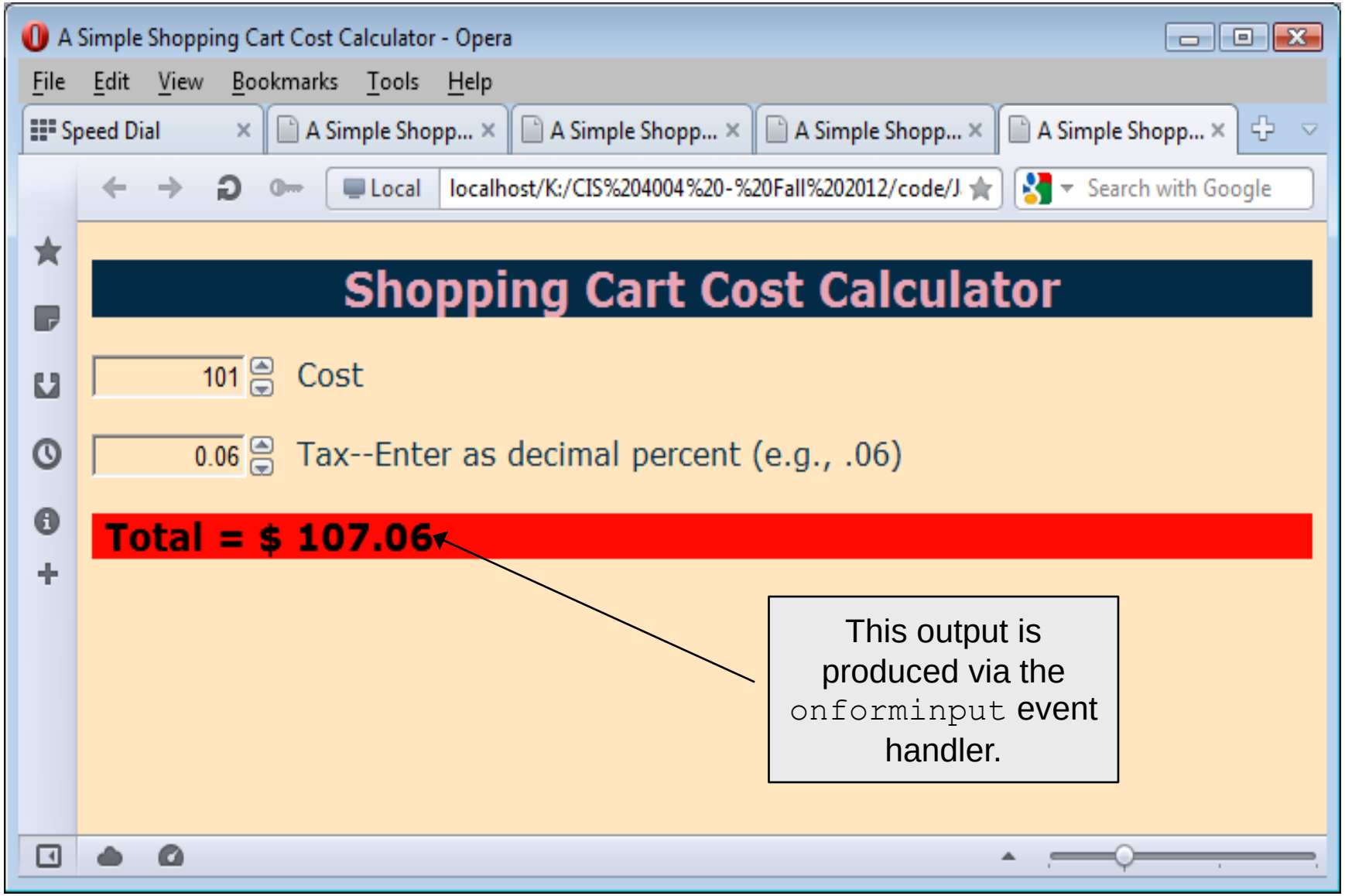
File Edit Search View Encoding Language Settings Macro Run TextFX Plugins Window ? X

PageOpener.html | OtherWindow.html | dom.html | shoppingOutput.html

```
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4      <meta charset="utf-8">
5      <title> A Simple Shopping Cart Cost Calculator</title>
6      <style type="text/css">
7      <!--
8          /*042B45,FFC54F,FFE6BF,E8A5B5,FF0A03*/
9          body { font-family:Verdana, Geneva, sans-serif;  background-color:#FFE6BF; color:#042B45;}
10         input { background-color:#FFE6BF;}
11         h1 { color:#E8A5B5; background-color:#042B45; text-align:center;  }
12         h3 { color:#FFC54F; background-color:#FF0A03;  }
13     -->
14     </style>
15 </head>
16 <body>
17     <header>
18       <h1>Shopping Calculator</h1>
19     </header>
20     <form>
21       <input name=cost type=number>  Cost <br>
22       <input name=tax type=number>   Tax--Enter as decimal percent (e.g., .06) <br>
23       <h3>  Total = $
24         <output onforminput="value = cost.valueAsNumber * tax.valueAsNumber + cost.valueAsNumber"></output>
25       </h3>
26     </form>
27 </body>
28 </html>
```

Hyper Text Markup Language file | length : 827 lines : 29 | Ln : 22 Col : 35 Sel : 0 | UNIX | ANSI as UTF-8 | INS




A Simple Shopping Cart Cost Calculator - Opera
File Edit View Bookmarks Tools Help
Speed Dial
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/J
Search with Google
Shopping Cart Cost Calculator
101
Cost
0.06
Tax--Enter as decimal percent (e.g., .06)
Total = $ 107.06
This output is produced via the onforminput event handler.

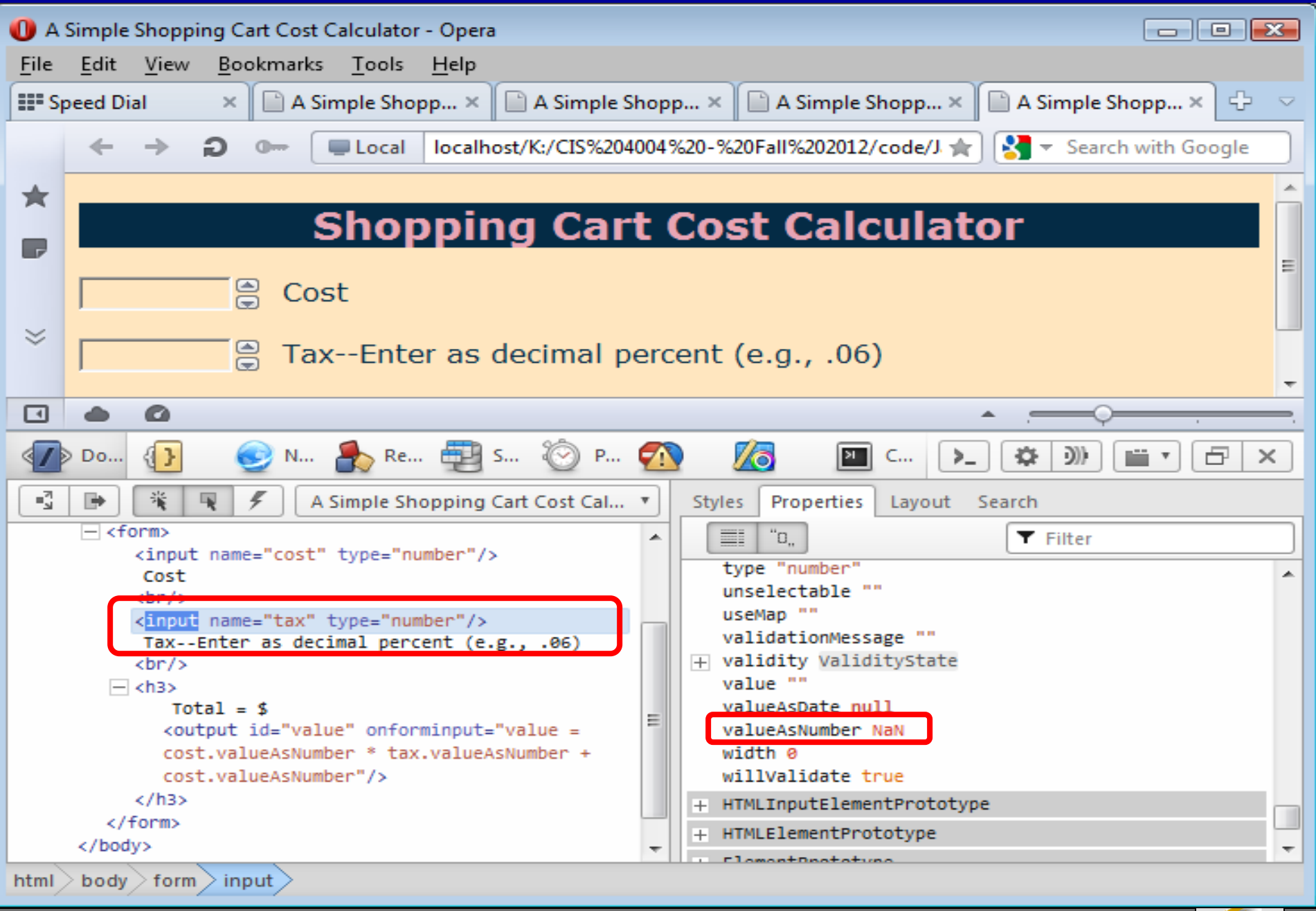


# Analysis Of The Previous Example

- Within the form container, two input elements are named `cost` and `tax`. In the context of the DOM, each is an object with certain properties, one of which is `valueAsNumber`. This is illustrated by the screen shot on the next page.

- Whatever number character is in the input form is treated as an actual number instead of a text character. The `valueAsNumber` is a property of the `<input>` element and not the `number` type that was used in the element. (I could have used a `text` value for the input type and had the same results using the input element.) Recall that the `number` type simply provides the selection list (see Inside HTML5 – Part 4 – Forms, pages 56-58 for more details.)

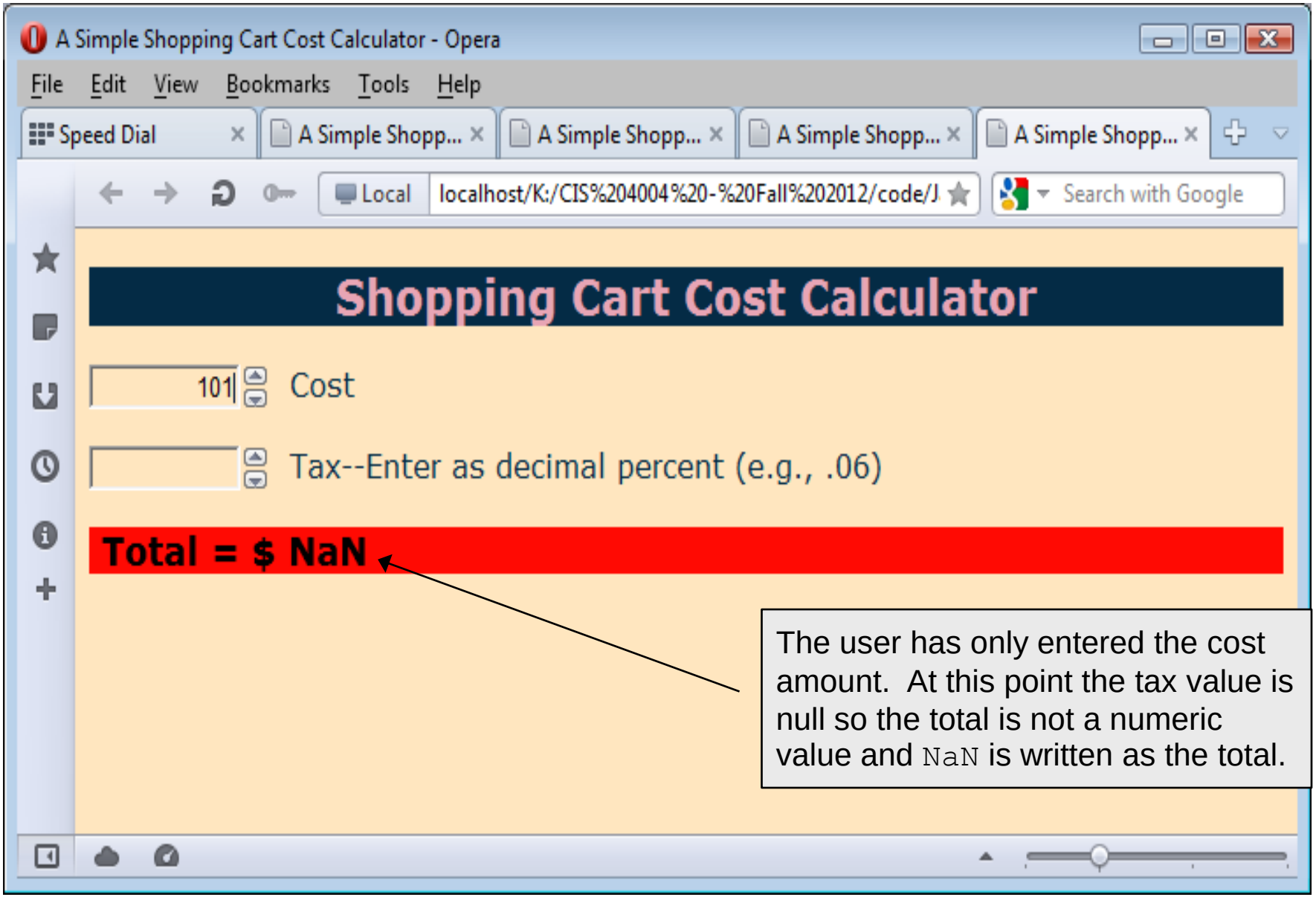


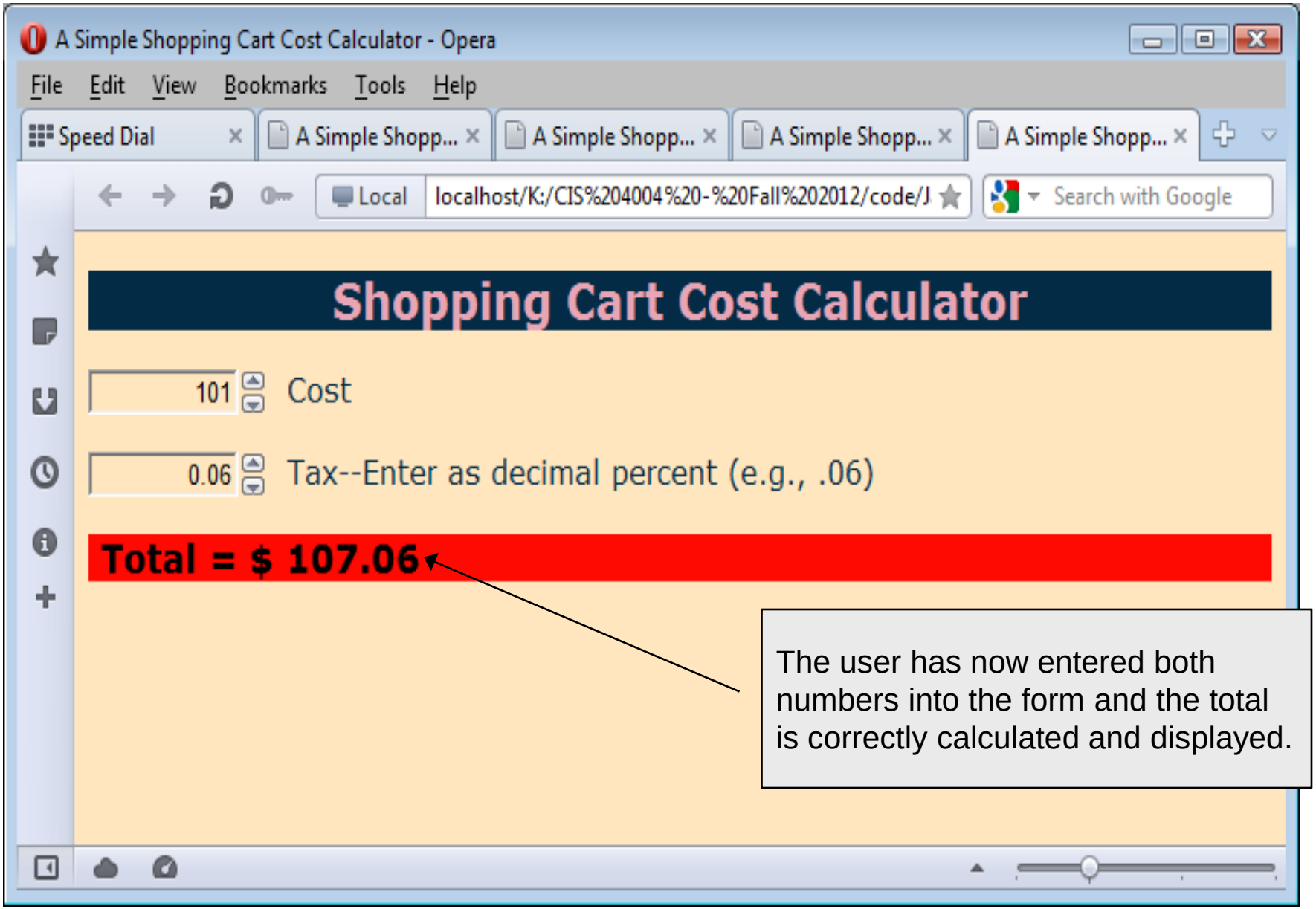

A Simple Shopping Cart Cost Calculator - Opera
File Edit View Bookmarks Tools Help
Speed Dial
A Simple Shopp...
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/J
Search with Google
Shopping Cart Cost Calculator
Cost
Tax--Enter as decimal percent (e.g., .06)
A Simple Shopping Cart Cost Cal...
<form>
<input name="cost" type="number"/>
Cost
<input name="tax" type="number"/>
Tax--Enter as decimal percent (e.g., .06)
<br/>
<h3>
Total = $
<output id="value" onforminput="value =
cost.valueAsNumber * tax.valueAsNumber +
cost.valueAsNumber"/>
</h3>
</form>
</body>
Styles
Properties
Layout
Search
Filter
type "number"
unselectable ""
useMap ""
validationMessage ""
validity ValidityState
value ""
valueAsDate null
valueAsNumber NaN
width 0
willValidate true
HTMLInputElementPrototype
HTMLElementPrototype
html
body
form
input

# Analysis Of The Previous Example

- The number type simply provides the "spinner" input control (the up/down arrows) window, but values in the input window are not automatically converted into numeric data.
- Notice how the `onforminput` event handler works. As information is entered into the form, the results are calculated and displayed.
- After the user has entered the cost, but before they have entered the tax, the result will be displayed as `NaN` (Not a Number) because the tax value is null, resulting in a non-numeric result. However, as soon as the tax is entered, the output changes to a number. See the next two screen shots.




A Simple Shopping Cart Cost Calculator - Opera
File Edit View Bookmarks Tools Help
Speed Dial
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/J
Search with Google
Shopping Cart Cost Calculator
101
Cost
Tax--Enter as decimal percent (e.g., .06)
Total = $ NaN
The user has only entered the cost amount. At this point the tax value is null so the total is not a numeric value and NaN is written as the total.


A Simple Shopping Cart Cost Calculator - Opera
File Edit View Bookmarks Tools Help
Speed Dial
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
A Simple Shopp...
Local
localhost/K:/CIS%204004%20-%20Fall%202012/code/J
Search with Google
Shopping Cart Cost Calculator
101
Cost
0.06
Tax--Enter as decimal percent (e.g., .06)
Total = $ 107.06
The user has now entered both numbers into the form and the total is correctly calculated and displayed.

temperature converter.html

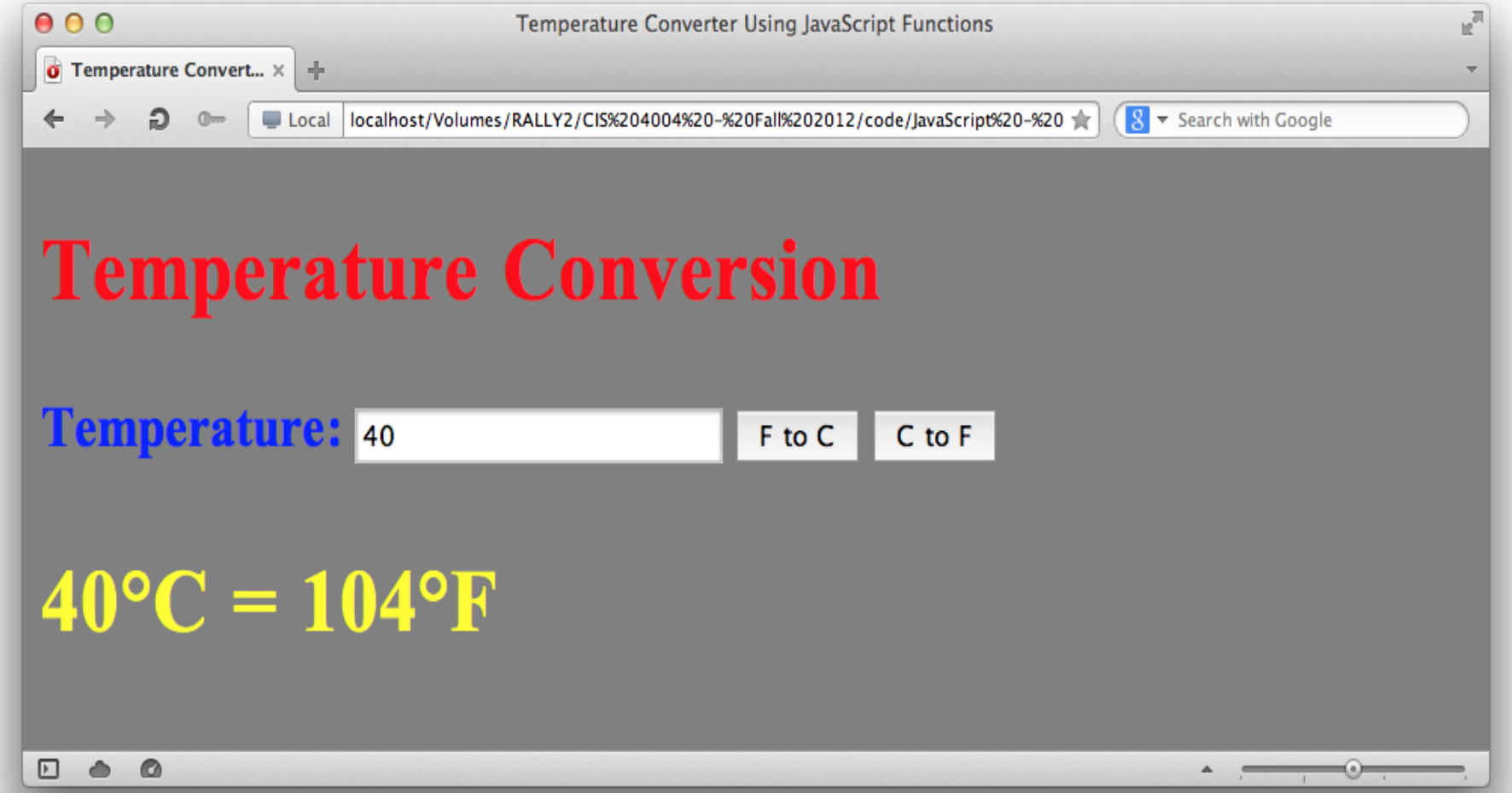
```
<!DOCTYPE html>
<html lang="en">
<head>
        <meta charset="utf-8">
        <title>Temperature Converter Using JavaScript Functions</title>
        <style type="text/css">
        <!--
                body { background-color:gray; color:blue; font-size:16pt; font-
weight:bold;}
                h2 { color:red;}
                p { color:yellow; font-size:24pt; }
        -->
        </style>

</head>
<body>
        <h2>Temperature Conversion</h2>
        <form>
                <label for="temperature">Temperature:</label>
                <input type="text" id="temperature" />
                <input type="button" id="f_to_c" name="f_to_c" value="F to C" />
                <input type="button" id="c_to_f" name="c_to_f" value="C to F" />
        </form>
        <p id="result"></p>
        <script src="scripts/temperature.js"></script>
</body>
</html>
```



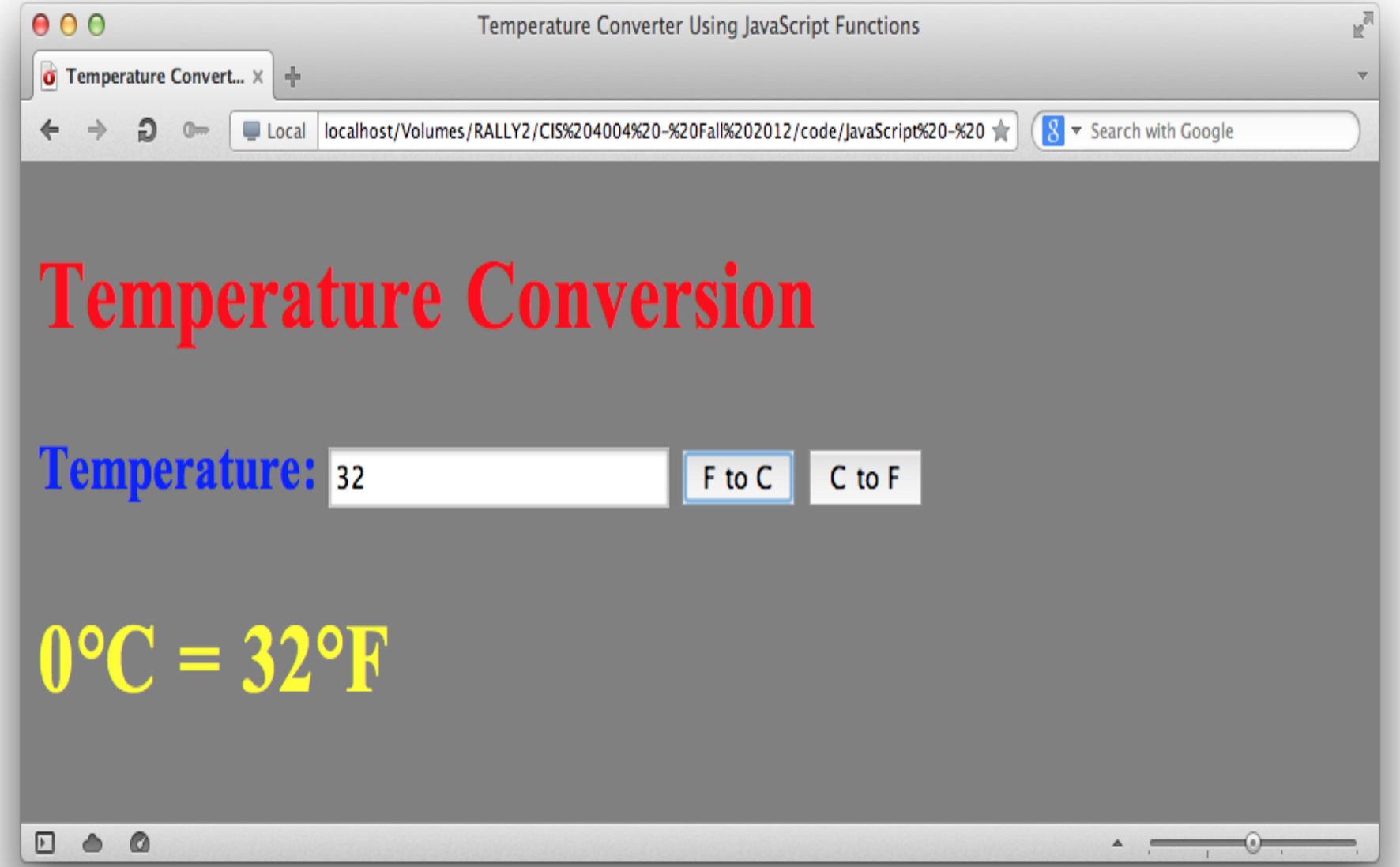
temperature.js

```
var report = function (celsius, fahrenheit) {
                document.getElementById("result").innerHTML = celsius + "\xb0C = " +
fahrenheit + "\xb0F";
};


document.getElementById("f_to_c").onclick = function () {
        var f = document.getElementById("temperature").value;
            report((f - 32) / 1.8, f);
};

document.getElementById("c_to_f").onclick = function () {
        var c = document.getElementById("temperature").value;
            report(c, 1.8 * c + 32);
};
```




Temperature Converter Using JavaScript Functions
Temperature Convert...
Local
localhost/Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20
Search with Google
Temperature Conversion
Temperature:
40
F to C
C to F
40°C = 104°F




Temperature Converter Using JavaScript Functions
Temperature Convert...
Local
localhost/Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20
Search with Google
Temperature Conversion
Temperature:
32
F to C
C to F
0°C = 32°F



K:\CIS 4004 - Fall 2012\code\JavaScript - Part 2\SimpleVariable.html - Notepad++

File Edit Search View Encoding Language Settings Macro Run TextFX Plugins Window ?

PageOpener.html | OtherWindow.html | dom.html | shoppingOutput.html | UserObject.html | SimpleVariable.html

```
12  </head>
13  <body>
14      <script type="text/javascript">
15      function advertisement() {
16          markVar="Brought to you by Mark's variable.";
17          return markVar;
18      }
19      //Variable with function
20      popUpAd=advertisement();
21      document.write(popUpAd);
22      //Variable with HTML5 code
23      cr="<br>";
24      document.write(cr);
25      // Variable with string
26      funHouse=" Elm Street";
27      // Boolean variable
28      var fate=true;
29      // Variable with string
30      query="Will I find true happiness in HTML5
31      // Variables with numbers
32      fun=100;
33      house=23;
34      // Math with variables
35      funPlusHouse=fun + house;
36      // Adding numeric and string variable (concatenation)
37      showAddress=funPlusHouse + funHouse;
38
39      browser=navigator.platform;
```

Hyper Text Markup Language file | length : 1141 lines : 49

K:\CIS 4004 - Fall 2012\code\JavaScript - Part 2\SimpleVariable.html - Note...

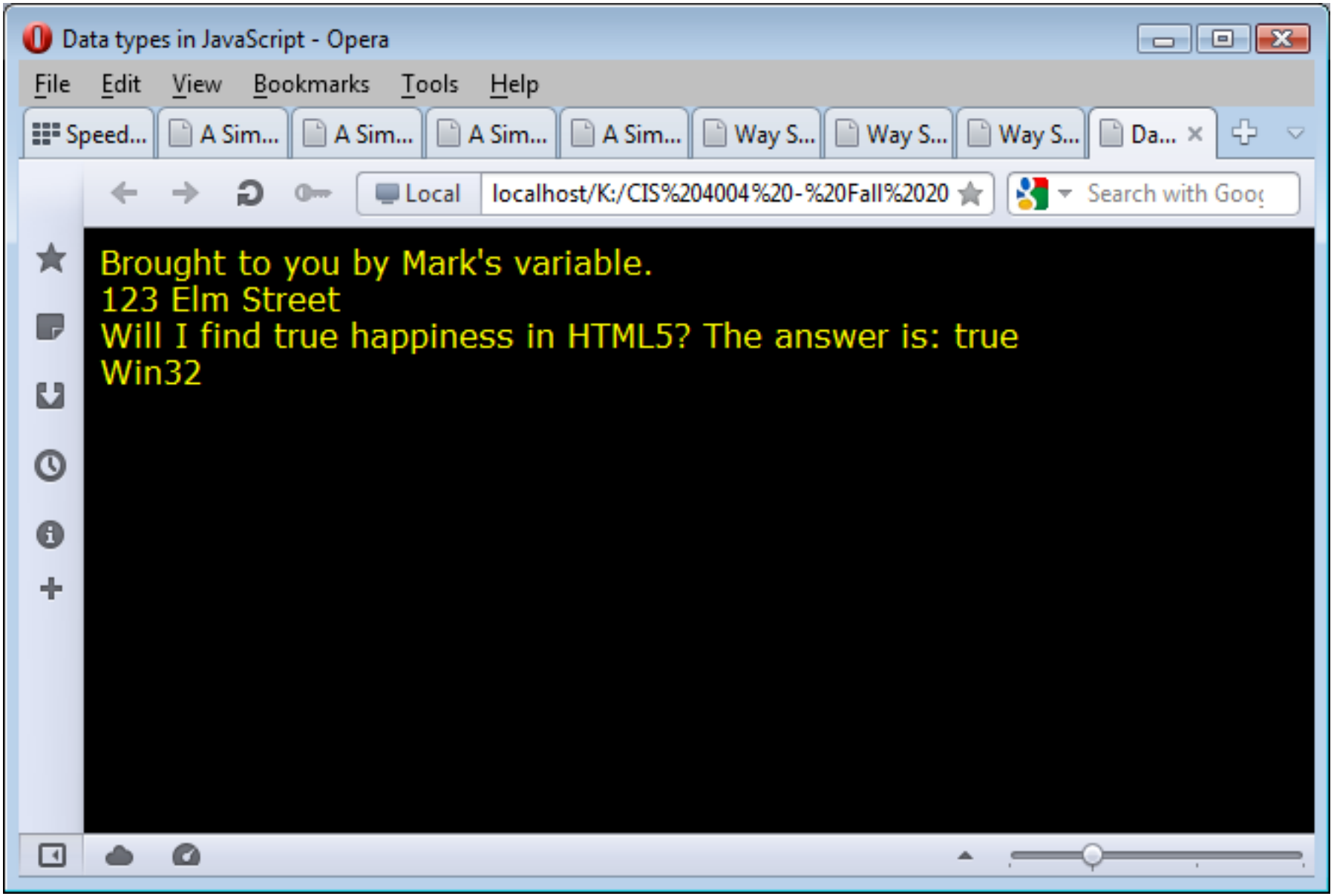
File Edit Search View Encoding Language Settings Macro Run TextFX Plugins Window ?

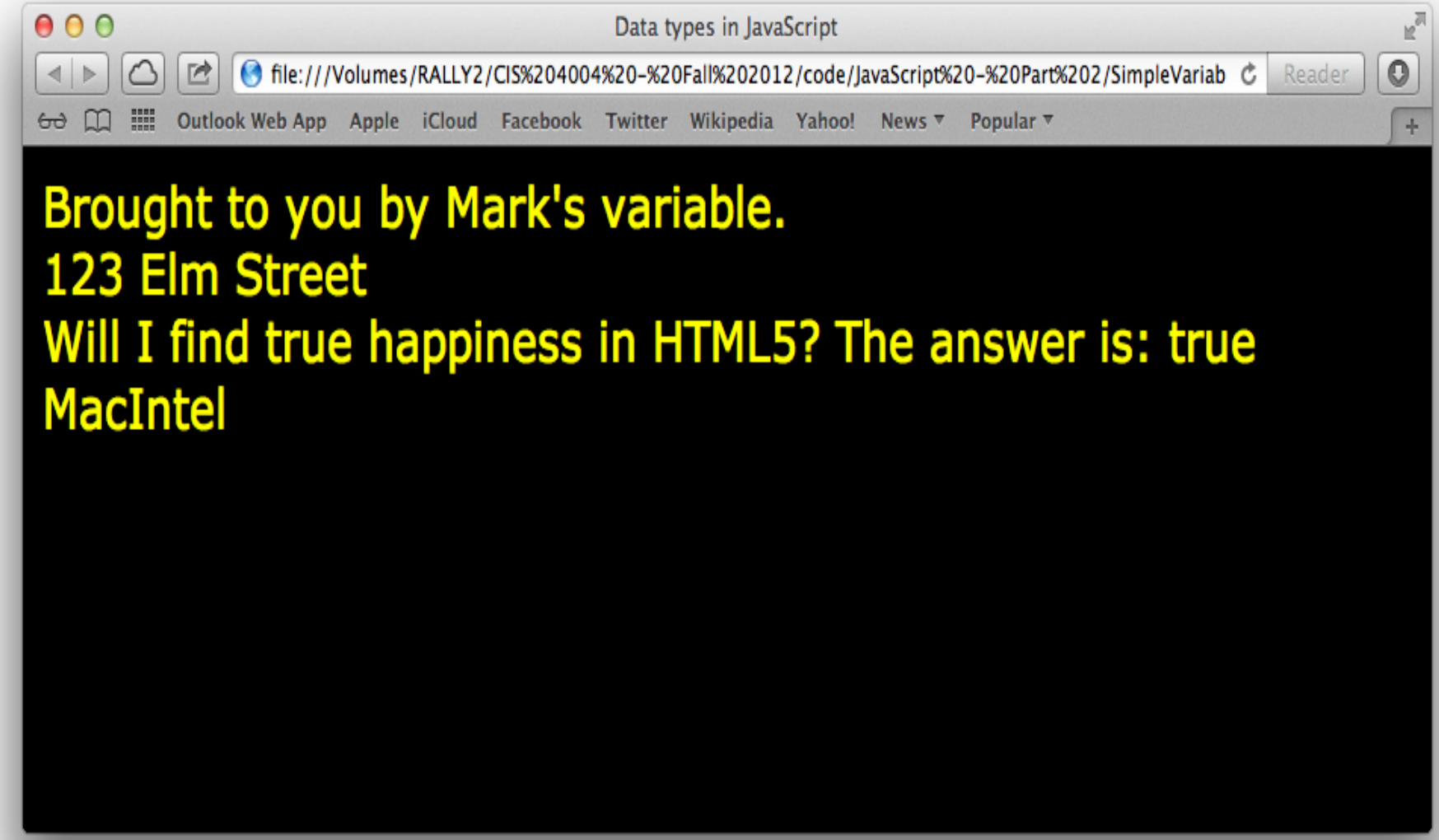
PageOpener.html | OtherWindow.html | dom.html | shoppingOutput.html | User

```
33      house=23;
34      // Math with variables
35      funPlusHouse=fun + house;
36      // Adding numeric and string variable (concatenation)
37      showAddress=funPlusHouse + funHouse;
38
39      browser=navigator.platform;
40      document.write(showAddress);
41      document.write(cr);
42      document.write(query);
43      document.write(fate);
44      document.write(cr);
45      document.write(browser);
46      </script>
47  </body>
48  </html>
```

Ln : 21 Col : 29 Sel : 0 | UNIX | ANSI | INS




Data types in JavaScript - Opera
File Edit View Bookmarks Tools Help
Speed... A Sim... A Sim... A Sim... A Sim... Way S... Way S... Way S... Da...
Local localhost/K:/CIS%204004%20-%20Fall%2020
Search with Goo
Brought to you by Mark's variable.
123 Elm Street
Will I find true happiness in HTML5? The answer is: true
Win32


Data types in JavaScript
file:///Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202/SimpleVariab
Reader
Outlook Web App
Apple
iCloud
Facebook
Twitter
Wikipedia
Yahoo!
News
Popular
Brought to you by Mark's variable.
123 Elm Street
Will I find true happiness in HTML5? The answer is: true
MacIntel



# Traversing And Modifying A DOM Tree

- The DOM enables you to programmatically access a document's elements, allowing you to modify its contents dynamically using JavaScript.
- The HTML5/CSS/JavaScript example we'll use is available on the course website, I did not include the markup in these notes. The example will allow you to traverse the DOM tree, modify nodes and create or delete content dynamically.
- The CSS class `highlighted` is applied dynamically to elements in the document as they are selected, added, or deleted using the form at the bottom of the document.
- As you play around with this example, be sure to do it in the developer tool so that you can see the DOM tree as well.

# Traversing And Modifying A DOM Tree

- The HTML5 document is manipulated dynamically by modifying its DOM tree.
- Each element has an `id` attribute, which is also displayed in square brackets at the beginning of the element (so you can see which element is which).
- The `click` event listeners are registered in the JavaScript (available on the course website) for the six buttons that call corresponding functions to perform the actions described by the button's `values`.



# Traversing And Modifying A DOM Tree

- The JavaScript begins by declaring two variables.
- Variable `currentNode` keeps track of the currently highlighted node (the initially highlighted node is the `[bigheading]`, the functionality of each button depends on which node in the document (DOM tree) is currently selected.
- The function `start` registers the event handlers for the buttons, then initializes the `currentNode` to the `<h1>` element, the element with `id = bigheading`.
- Note that the function `start` is called when the window's `load` event occurs.

# Traversing And Modifying A DOM Tree

- The JavaScript variable `idcount` is used to assign a unique id to any new elements that are dynamically created by the user.
- The remainder of the JavaScript contains the event handling functions for the buttons and two helper functions (`switchTo` and `createNewNode`) that are called by the event handlers.
- Over the next few pages, I'll explain how each of the buttons and its corresponding event handler works. Before reading on, you should download the markup, the style sheet, and the JavaScript files and play around with the page a bit to get a feel for what's happening with the page as the user manipulates the page.



# Finding and Highlighting an Element Using `getElementById`, `setAttribute` and `getAttribute`

- The first row of the form allows the user to enter the `id` of an element into the text field and click the `Get By id` button to find and highlight the element.
- The button's click event calls function `byId()`.

```
// get and highlight an element by its id attribute
function byId()
{
   var id = document.getElementById( "gbi" ).value;
   var target = document.getElementById( id );

   if ( target )
      switchTo( target );
} // end function byId
```



# Finding and Highlighting an Element Using `getElementById`, `setAttribute` and `getAttribute`

- First, the `byId()` function uses `getElementById` to assign the contents of the text field to the variable `id`.
- Next , the `byID()` function uses `getElementById` to find the element whose id attribute matches the value of variable `id` and assigns this to the variable `target`.
- If an element is found with the specified `id`, and object is returned; otherwise, `null` is returned.
- Next, the function checks to see whether `target` is an object (any object used as a boolean expression is true, while `null` is false). If `target` evaluates to true, the `switchTo()` helper function is called with `target` as its argument.

# Finding and Highlighting an Element Using `getElementById`, `setAttribute` and `getAttribute`

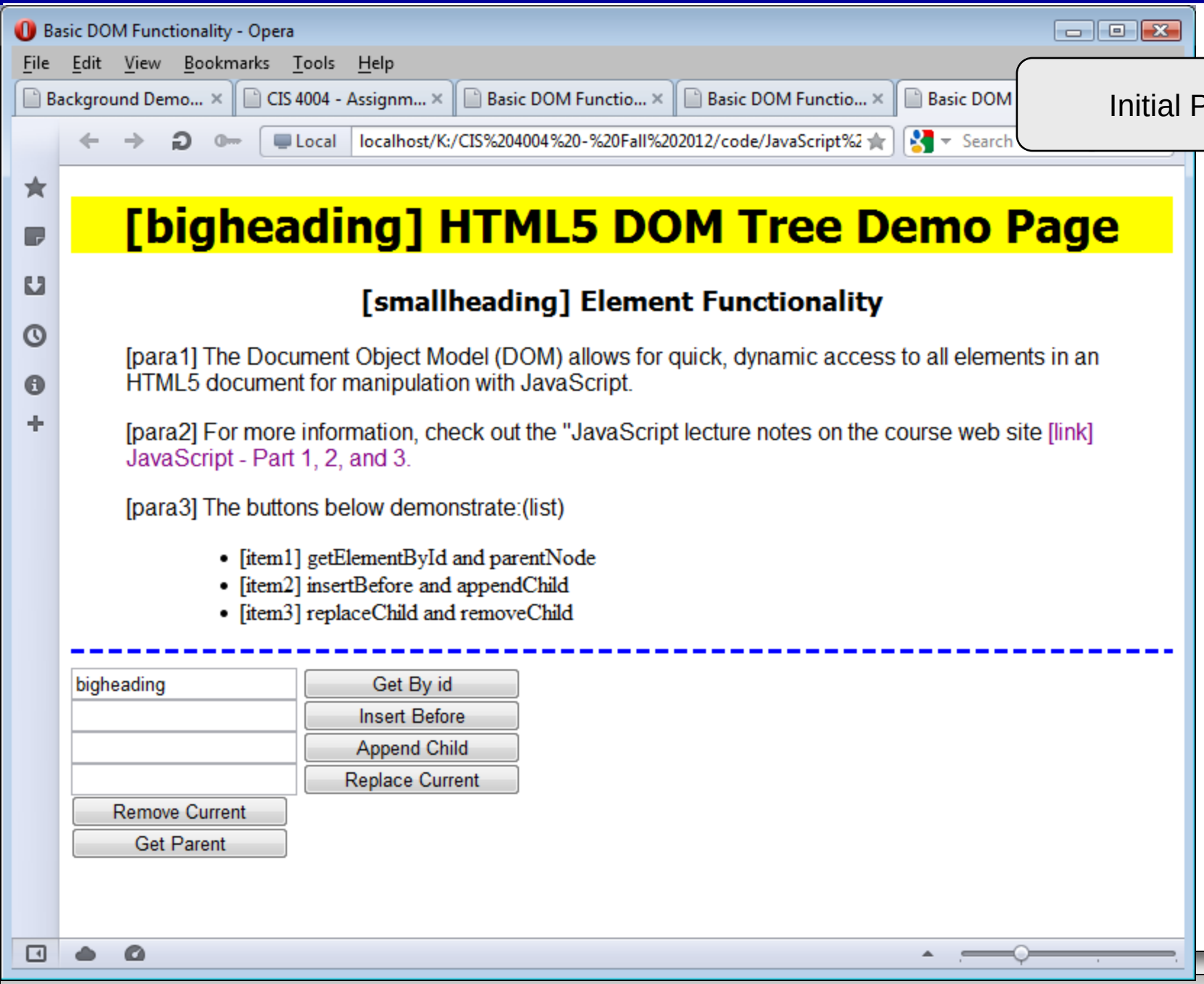
- The `switchTo()` helper function is used a lot in this JavaScript to highlight an element in the page. The current element is given a yellow background (via the CSS class `highlighted`).
- The DOM element methods `setAttribute` and `getAttribute` allow you to modify and get an attribute's value, respectively.
- The function `switchTo` function uses the `setAttribute` method to set the current node's class attribute to the empty string. This clears the `class` attribute to remove the highlighted class from the `currentNode` before the new node is highlighted.



# Finding and Highlighting an Element Using `getElementById`, `setAttribute` and `getAttribute`

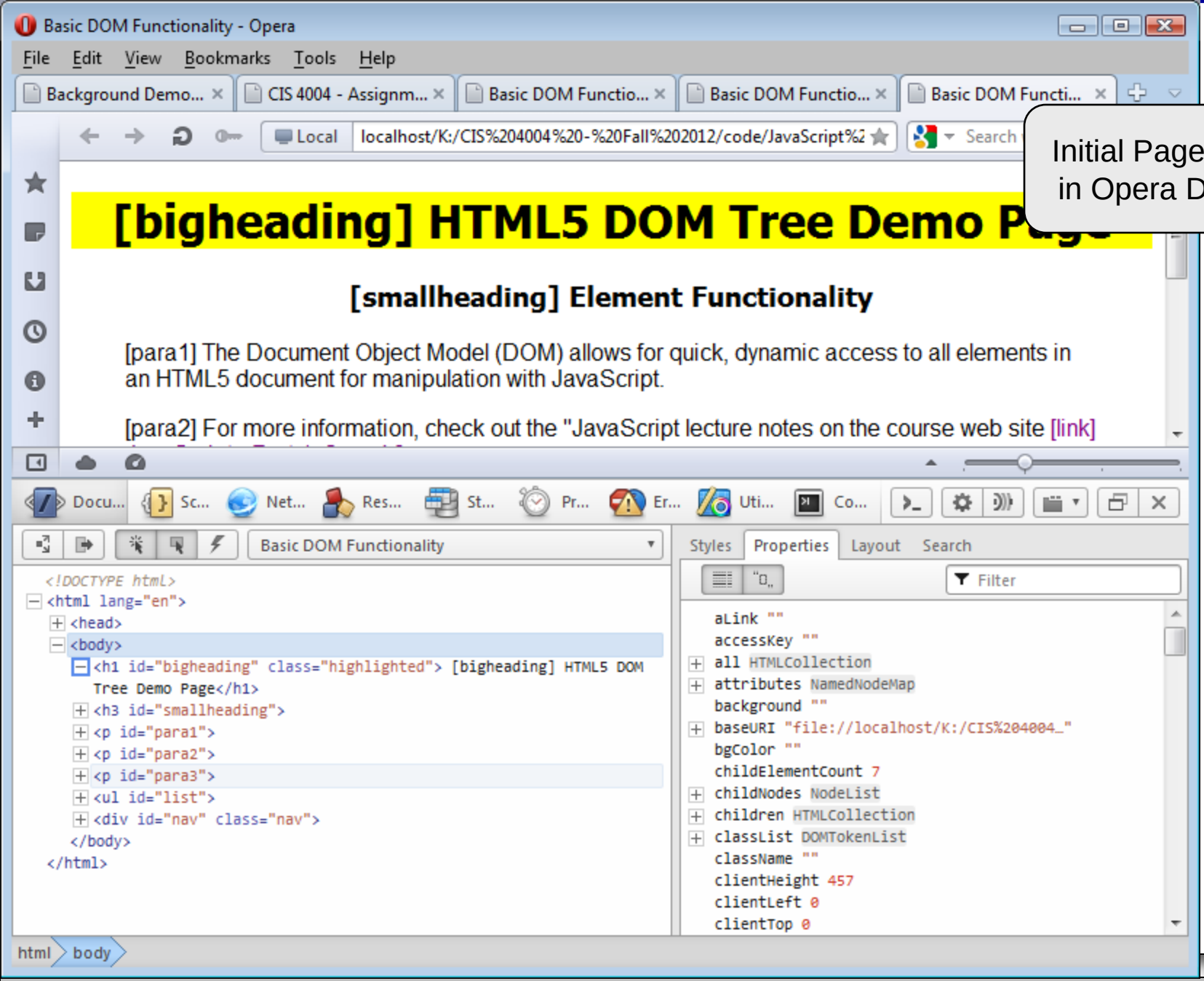
- The last thing the `byID` function does is uses the `getAttribute` method to get the `currentNode`'s `id` and assign it to the input field's `value` property.
- This isn't necessary when this helper function is called by `byID`, but as you'll see later, other functions call `switchTo` as well. In these cases, this line ensures that the text field's `value` contains the currently selected node's `id`.
- Notice that `setAttribute` was not used to change the `value` of the input field. Methods `setAttribute` and `getAttribute` do not work for user-modifiable content, such as the value displayed in an input field.





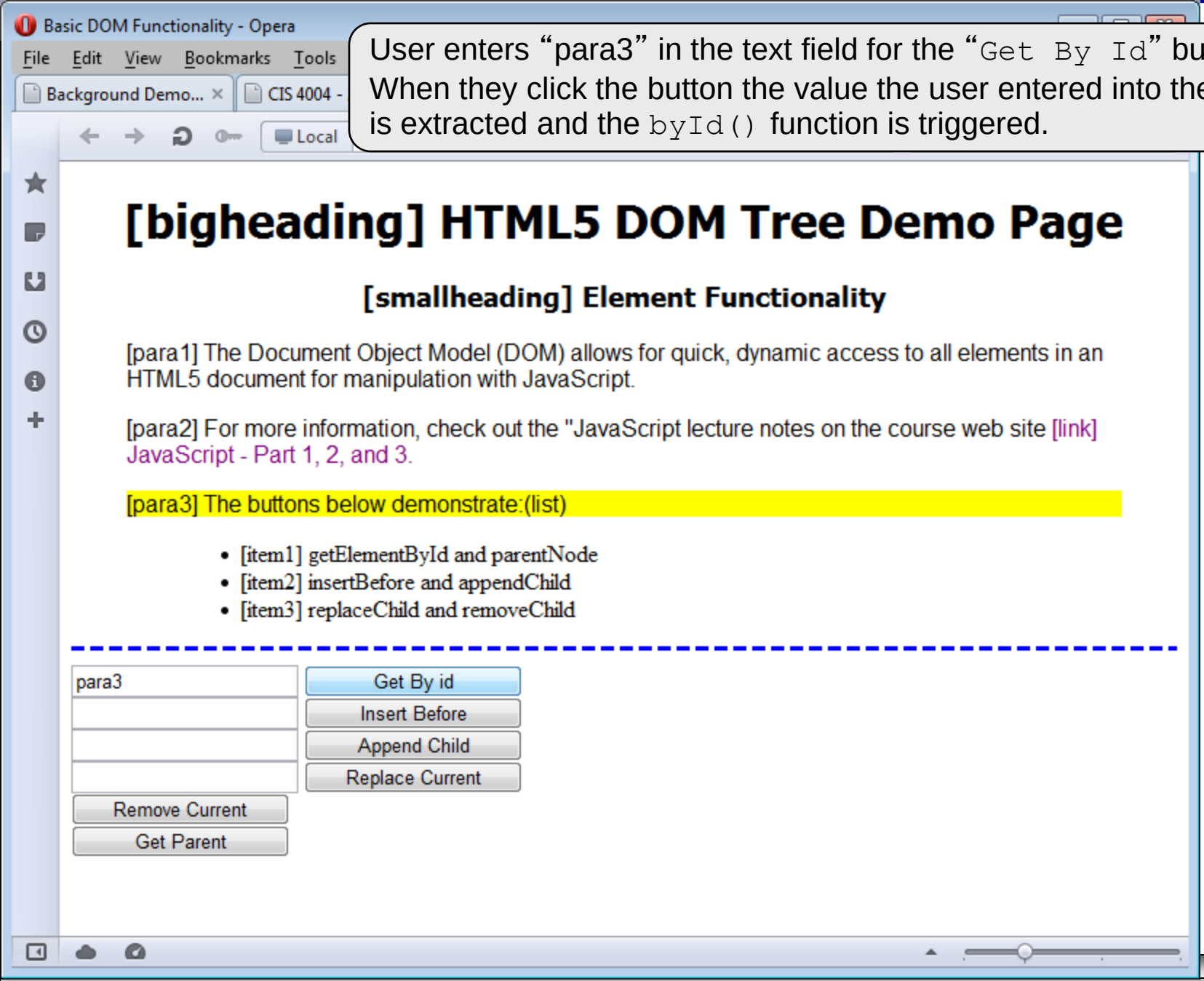

Initial Page






Initial Page – Shown in Opera DragonFly

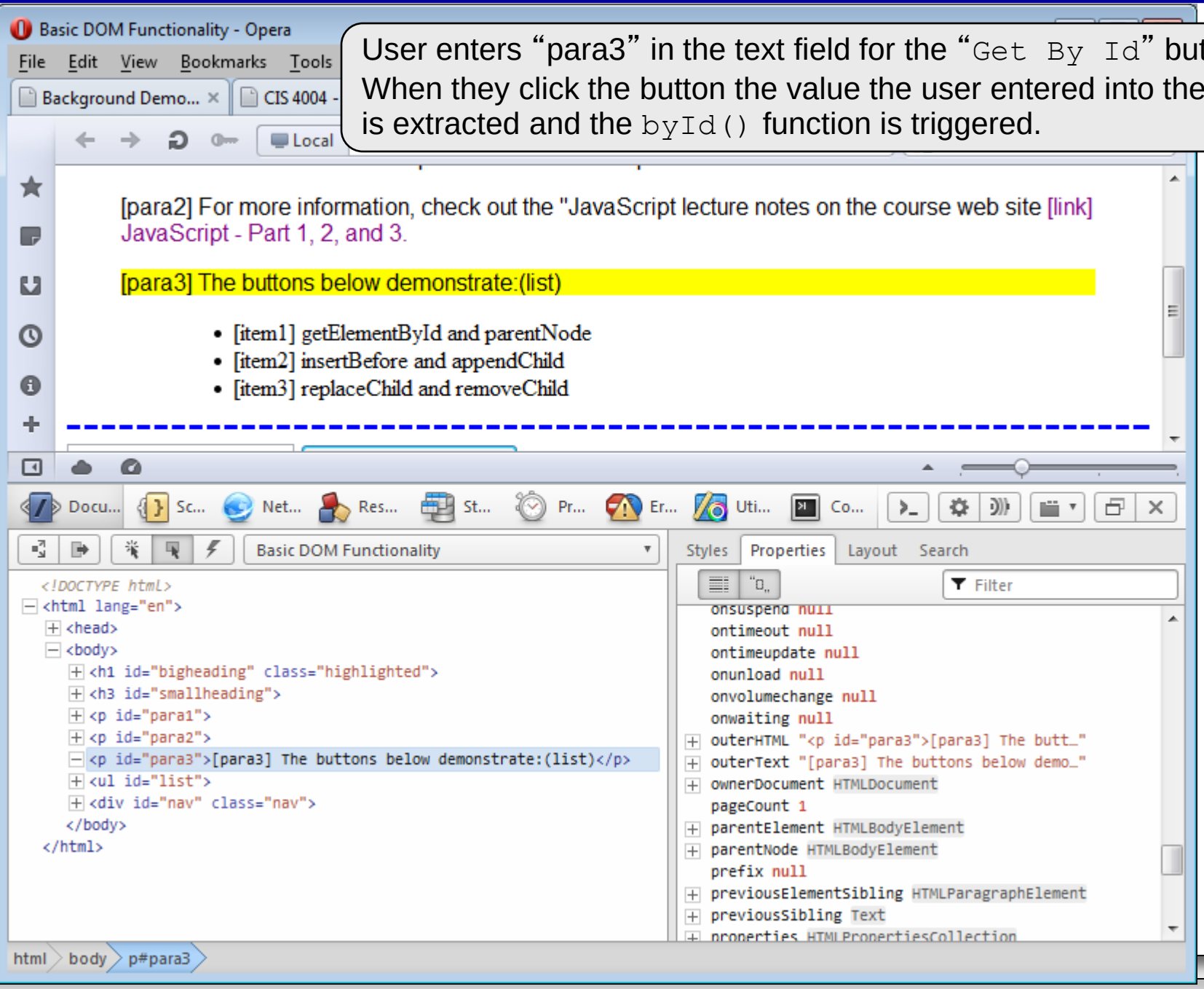





User enters "para3" in the text field for the "`Get By Id`" button. When they click the button the value the user entered into the text field is extracted and the `byId()` function is triggered.



User enters "para3" in the text field for the "`Get By Id`" button. When they click the button the value the user entered into the text field is extracted and the `byId()` function is triggered.



# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

- The second and third rows of the form allow the user to create a new element and insert it before or as a child of the current node, respectively.
- If the user enters text in the second text field and clicks the `Insert Before` button, the text is placed in a new paragraph element, which is inserted into the document before the currently selected element.
- The `Insert Before` button's click event calls function `insert()`.

# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

- The `insert()` function calls the `createNewNode()` function , passing it the value of the "ins" input field as an argument.
- The helper function `createNewNode()` creates a paragraph node that contains the text passed to it.

```
// insert a paragraph element before the current element
// using the insertBefore method
function insert()
{
    var newNode = createNewNode(
        document.getElementById( "ins" ).value );
    currentNode.parentNode.insertBefore( newNode, currentNode );
    switchTo( newNode );
} // end function insert
```



# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

- Function `createNewNode()` creates a `<p>` element using the document's `createElement` method, which creates a new DOM node, taking the tag name as an argument.
- The `createElement` method creates an element…it does ***not*** insert the element on the page.

```
// helper function that returns a new paragraph node containing
// a unique id and the given text
function createNewNode( text )
{
   var newNode = document.createElement( "p" );
   nodeId = "new" + idcount;
   ++idcount;
   newNode.setAttribute( "id", nodeId ); // set newNode's id
   text = "[" + nodeId + "] " + text;
   newNode.appendChild( document.createTextNode( text ) );
   return newNode;
} // end function createNewNode
```



# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

- To create the new element, a unique `id` for it is created by concatenating the string "`new`" with the current value of `idcount`.
- The `setAttribute` function is then called to set the `id` of the new element.
- The value of the text is concatenated with the square brackets used to identify the nodes to the user.
- Then the document's `createTextNode` method is called to create a node that contains only text. This new node is then used as the argument to the `appendChild` method, which inserts a child node after any existing children of the node on which it is called.



# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

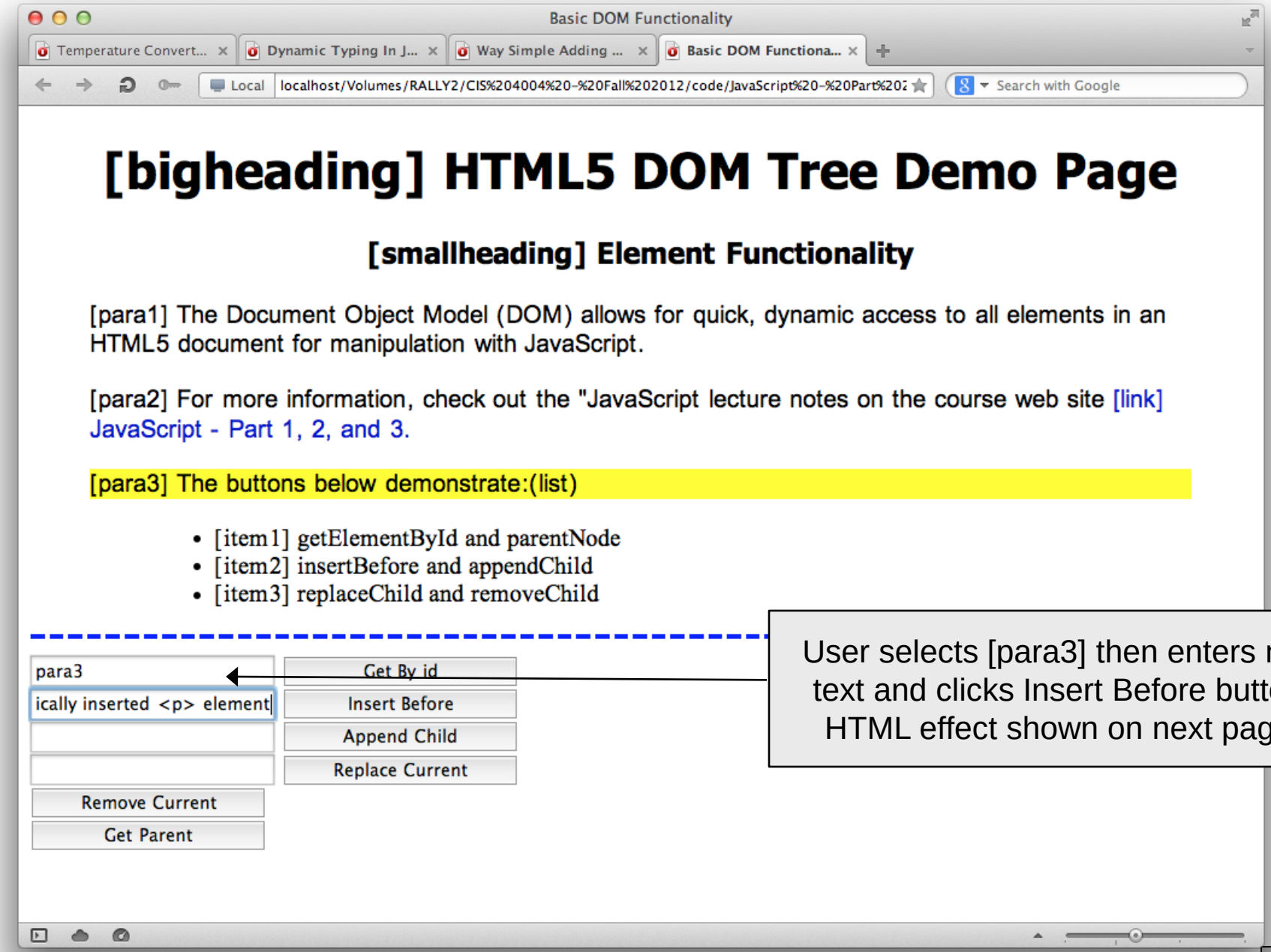
- After the `<p>` element is created by `createNewNode` that function returns the new node to the `insert` function, where it's assigned to the variable `newNode`.
- The `newNode` is then inserted before the currently selected node.
- The `parentNode` property contains a node's parent. This property is used in the `insert` function to get the current node's parent. Then the `insertBefore` method is invoked on the parent node with `newNode` and `currentNode` as its arguments. This causes `newNode` to be inserted as a child of the parent directly before `currentNode`.



# Creating and Inserting New Elements Using `insertBefore` and `appendChild`

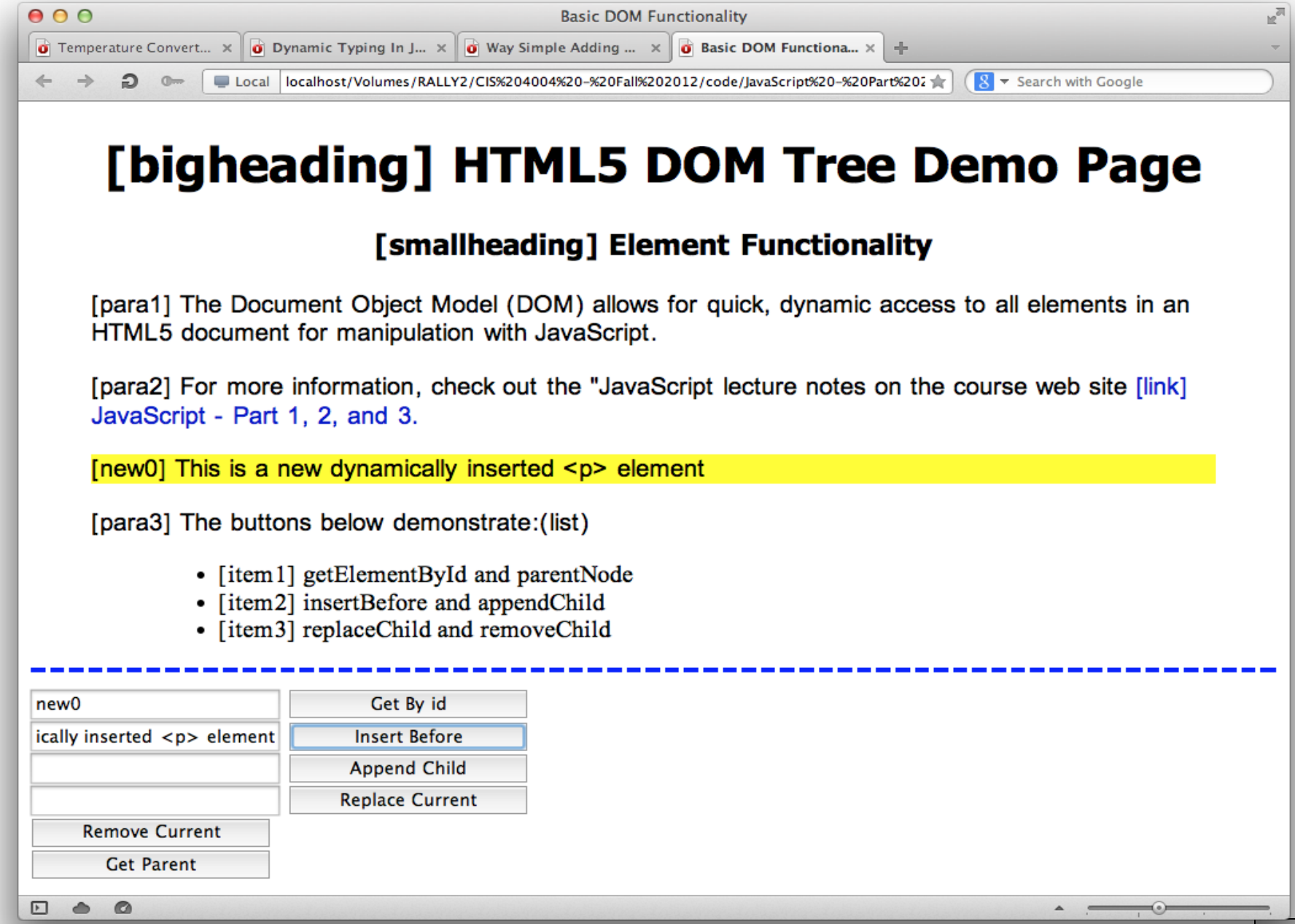
- Finally, the `switchTo` helper function is called to set the highlighted class on the newly created element.
- The input field and button on the third line of the input form allows the user to append a new paragraph node as a child of the current element.
- This is done in a similar manner to the `Insert Before` button's `insert` function. However, in this case the function `appendNode` creates the new node and inserts it as a child of the current node. Examine the JavaScript more closely to see how this mirrors the insert function and also how it differs.

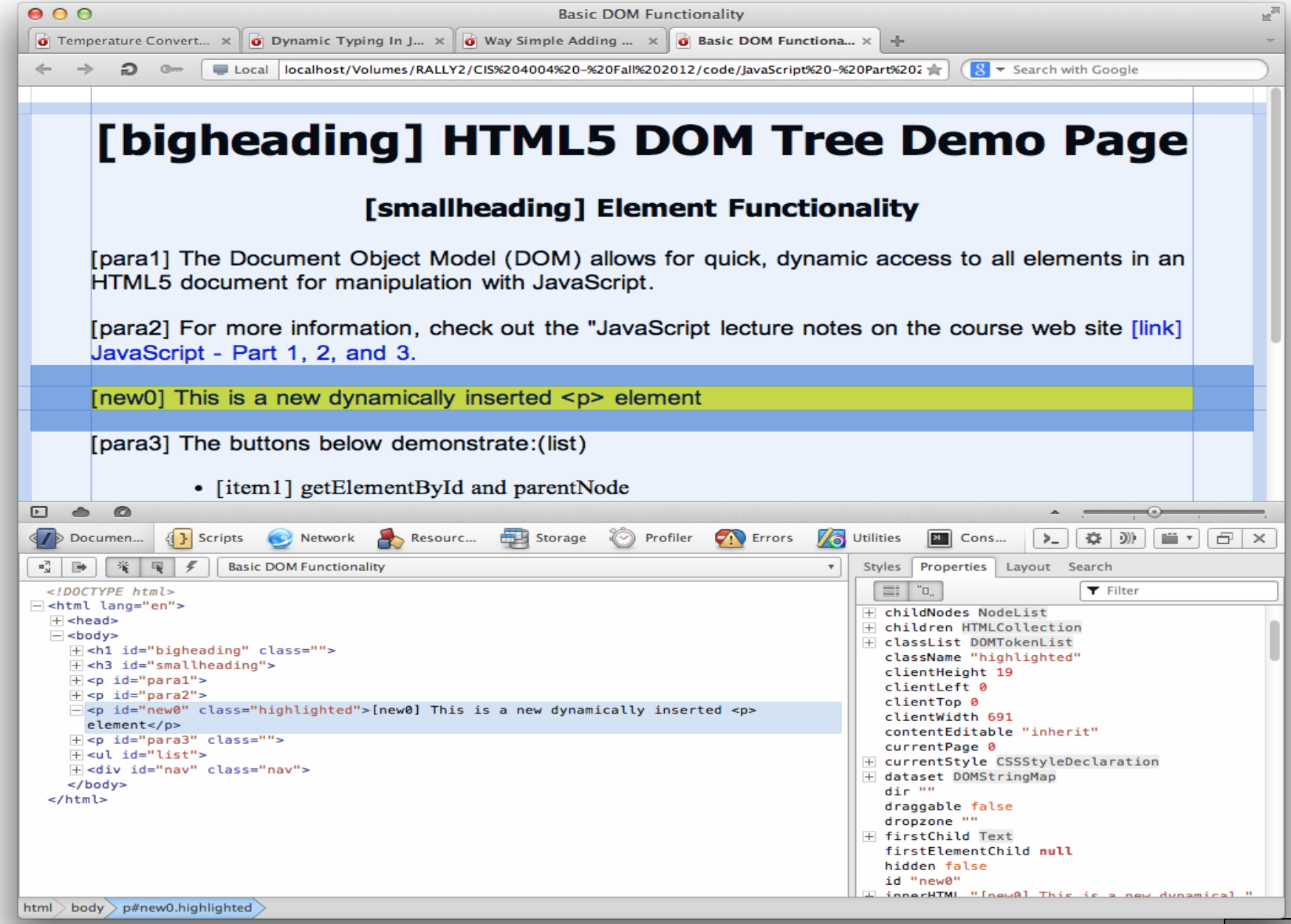





User selects [para3] then enters new text and clicks Insert Before button. HTML effect shown on next page.




Basic DOM Functionality
Temperature Convert...
Dynamic Typing In J...
Way Simple Adding ...
Basic DOM Functiona...
Local
localhost/Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202
Search with Google
[bigheading] HTML5 DOM Tree Demo Page
[smallheading] Element Functionality
[para1] The Document Object Model (DOM) allows for quick, dynamic access to all elements in an HTML5 document for manipulation with JavaScript.
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
[new0] This is a new dynamically inserted <p> element
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
[item2] insertBefore and appendChild
[item3] replaceChild and removeChild
new0
ically inserted <p> element
Get By id
Insert Before
Append Child
Replace Current
Remove Current
Get Parent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[new0] This is a new dynamically inserted  element
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
Documen...
Scripts
Network
Resourc...
Storage
Profiler
Errors
Utilities
Cons...
Basic DOM Functionality
<!DOCTYPE html>
<html lang="en">
<head>
<body>
<h1 id="bigheading" class="">
<h3 id="smallheading">

[new0] This is a new dynamically inserted 
element

<ul id="list">

</body>
</html>
Styles
Properties
Layout
Search
Filter
childNodes NodeList
children HTMLCollection
classList DOMTokenList
className "highlighted"
clientHeight 19
clientLeft 0
clientTop 0
clientWidth 691
contentEditable "inherit"
currentPage 0
currentStyle CSSStyleDeclaration
dataset DOMStringMap
dir ""
draggable false
dropzone ""
firstChild Text
firstElementChild null
hidden false
id "new0"
html
body
p#new0.highlighted

# Replacing and Removing Elements Using `replaceChild` and `removeChild`

- The next two buttons on the input form provide the user with the ability to replace the current element with a new `<p>` element or simply to remove the element entirely.
- When the user clicks the `Replace Current` button, the function `replaceCurrent` is called.
- In function `replaceCurrent`, the `createNewNode` helper function is called in much the same manner as it was when the `InsertBefore` or `AppendChild` buttons were clicked.
- The user's text is retrieved from the input field in the form and the parent of the current node is determined, then the `replaceChild` method is invoked on the parent.

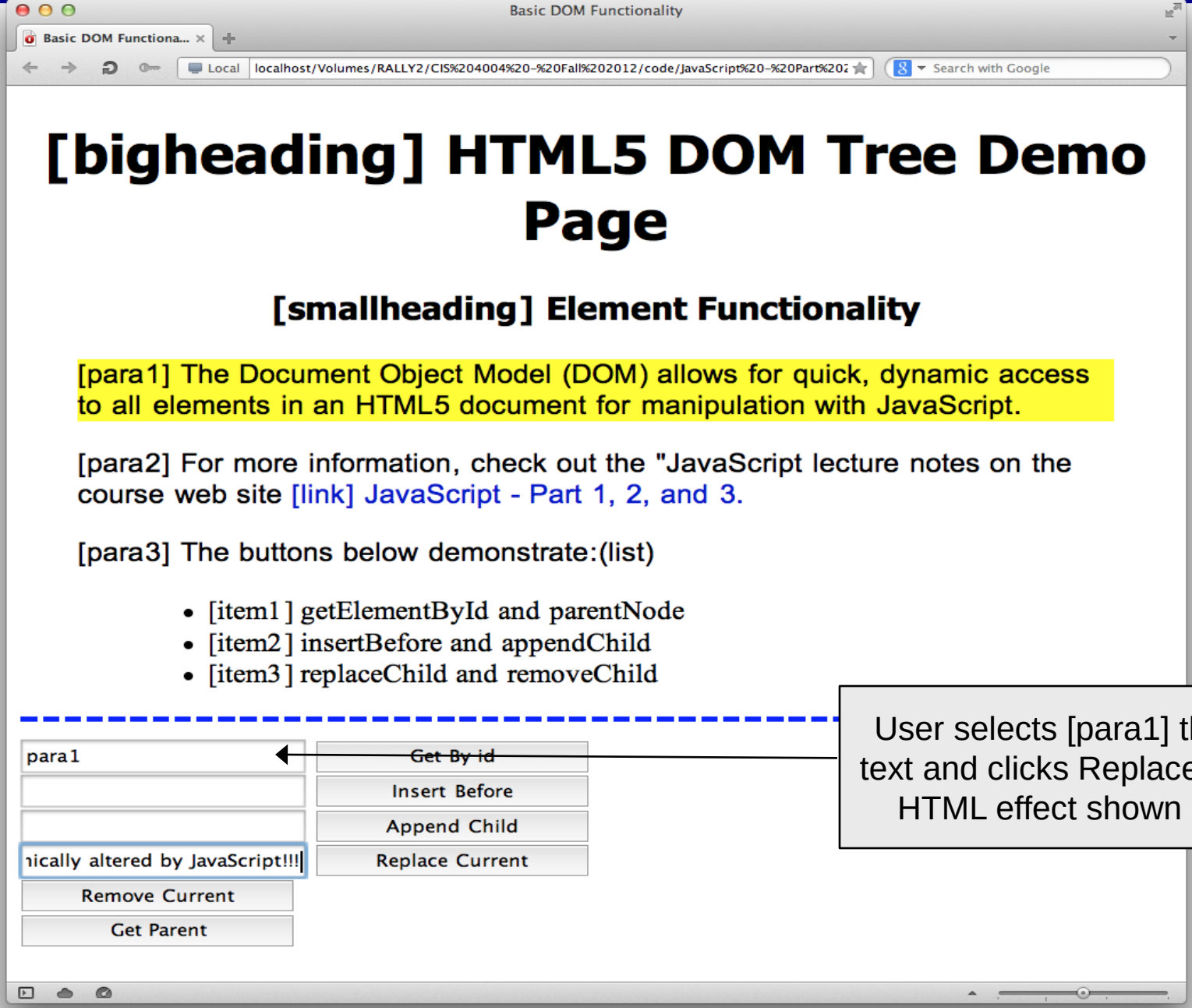
# Replacing and Removing Elements Using `replaceChild` and `removeChild`

- `The replaceChild` method takes two arguments, the first of which is the new node to be inserted, and the second is the node to be replaced.

dom.js

```
// replace the currently selected node with a paragraph node
function replaceCurrent()
{
   var newNode = createNewNode(
      document.getElementById( "replace" ).value );
   currentNode.parentNode.replaceChild( newNode, currentNode );
   switchTo( newNode );
} // end function replaceCurrent
```




Basic DOM Functionality
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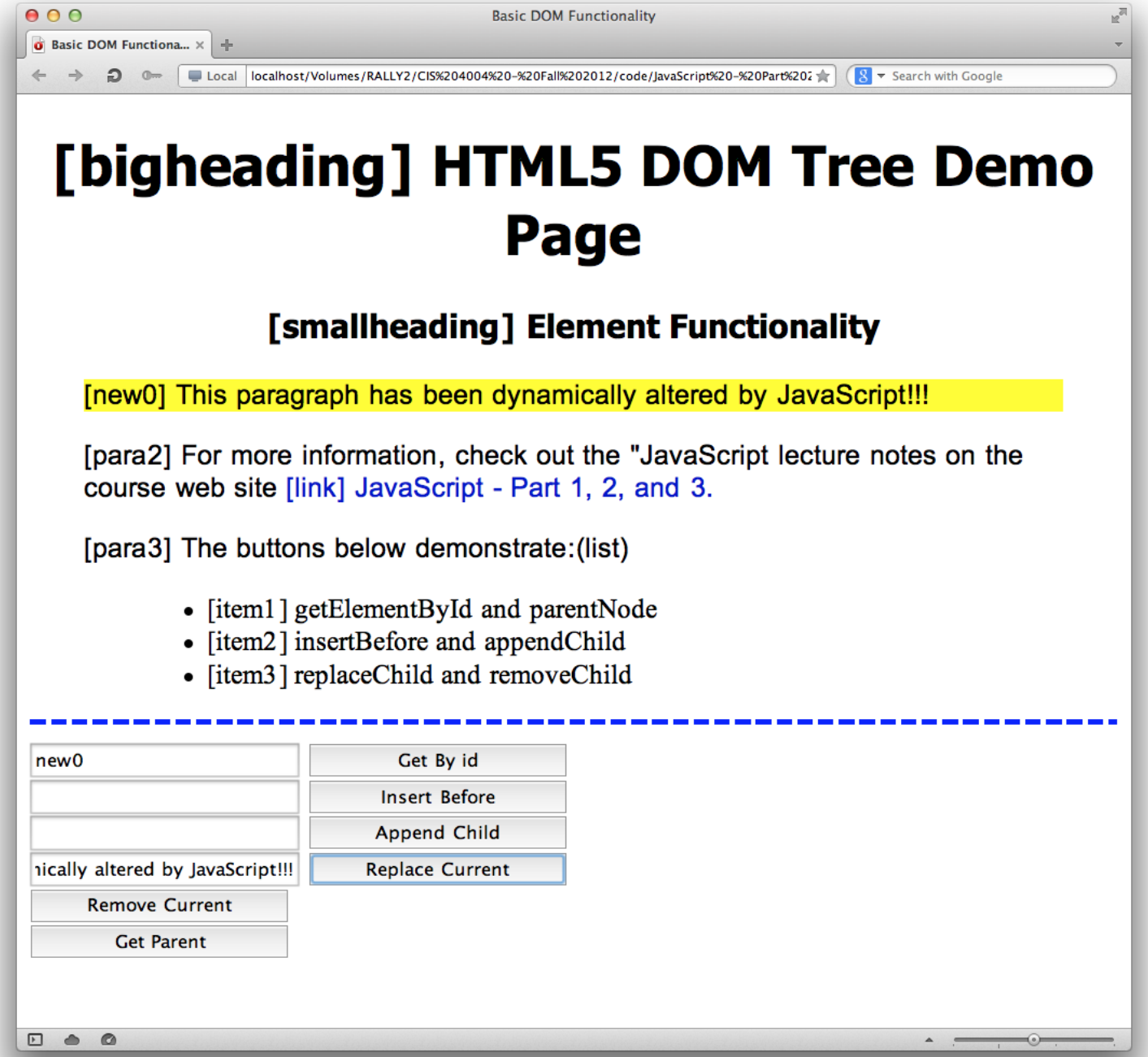
[item1 ] getElementById and parentNode
[item2 ] insertBefore and appendChild
[item3 ] replaceChild and removeChild
para1
Get By id
Insert Before
Append Child
ically altered by JavaScript!!!
Replace Current
Remove Current
Get Parent
User selects [para1] then enters new text and clicks Replace Current button. HTML effect shown on next page.


Basic DOM Functionality
Basic DOM Functiona...
Local
localhost/Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202
Search with Google
[bigheading] HTML5 DOM Tree Demo Page
[smallheading] Element Functionality
[new0] This paragraph has been dynamically altered by JavaScript!!!
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
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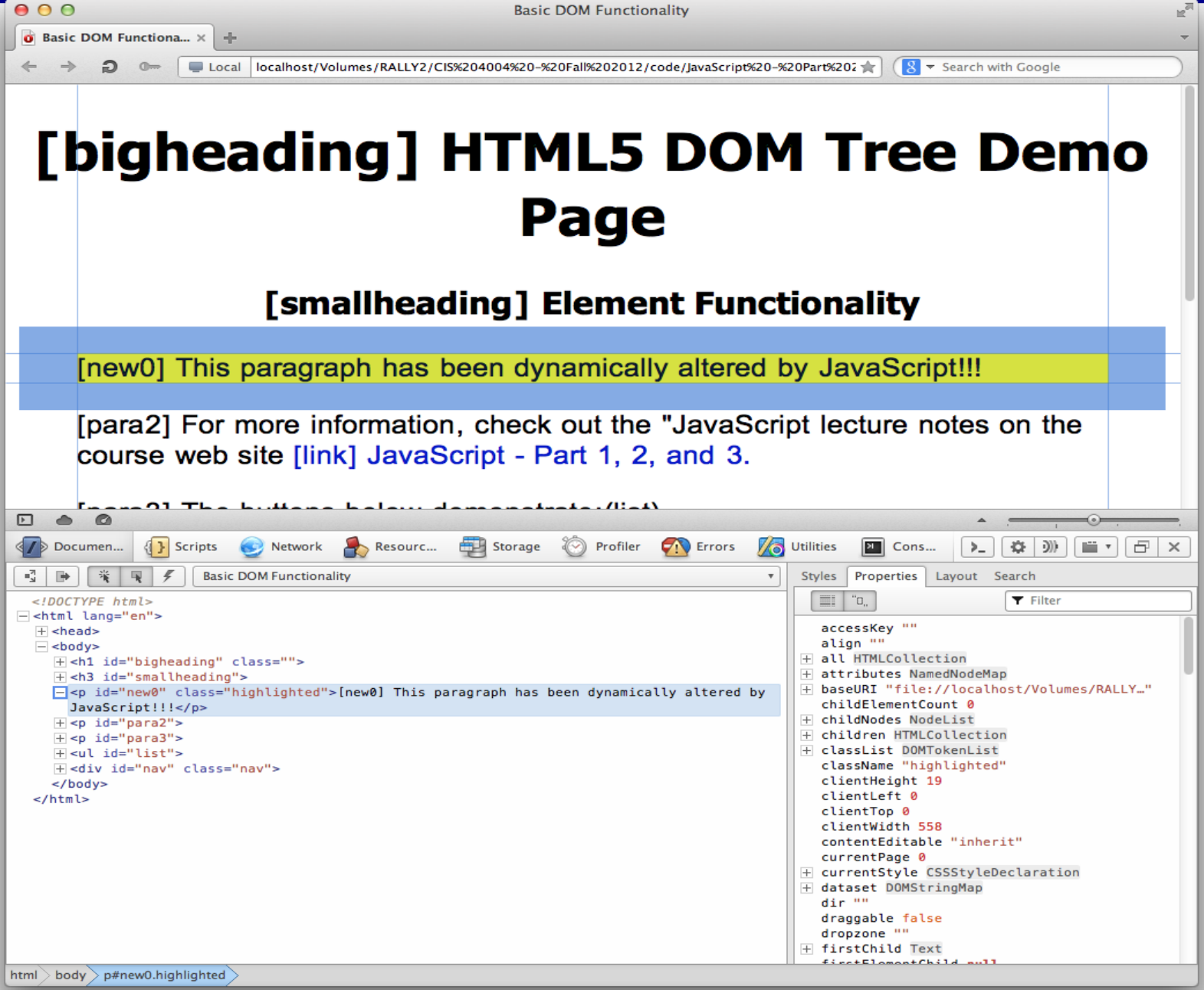
[item1 ] getElementById and parentNode
[item2 ] insertBefore and appendChild
[item3 ] replaceChild and removeChild
new0
Get By id
Insert Before
Append Child
ically altered by JavaScript!!!
Replace Current
Remove Current
Get Parent

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Documen...
Scripts
Network
Resourc...
Storage
Profiler
Errors
Utilities
Cons...
Basic DOM Functionality
<!DOCTYPE html>
<html lang="en">
<head>
<body>
<h1 id="bigheading" class="">
<h3 id="smallheading">
[new0] This paragraph has been dynamically altered by JavaScript!!!

<ul id="list">

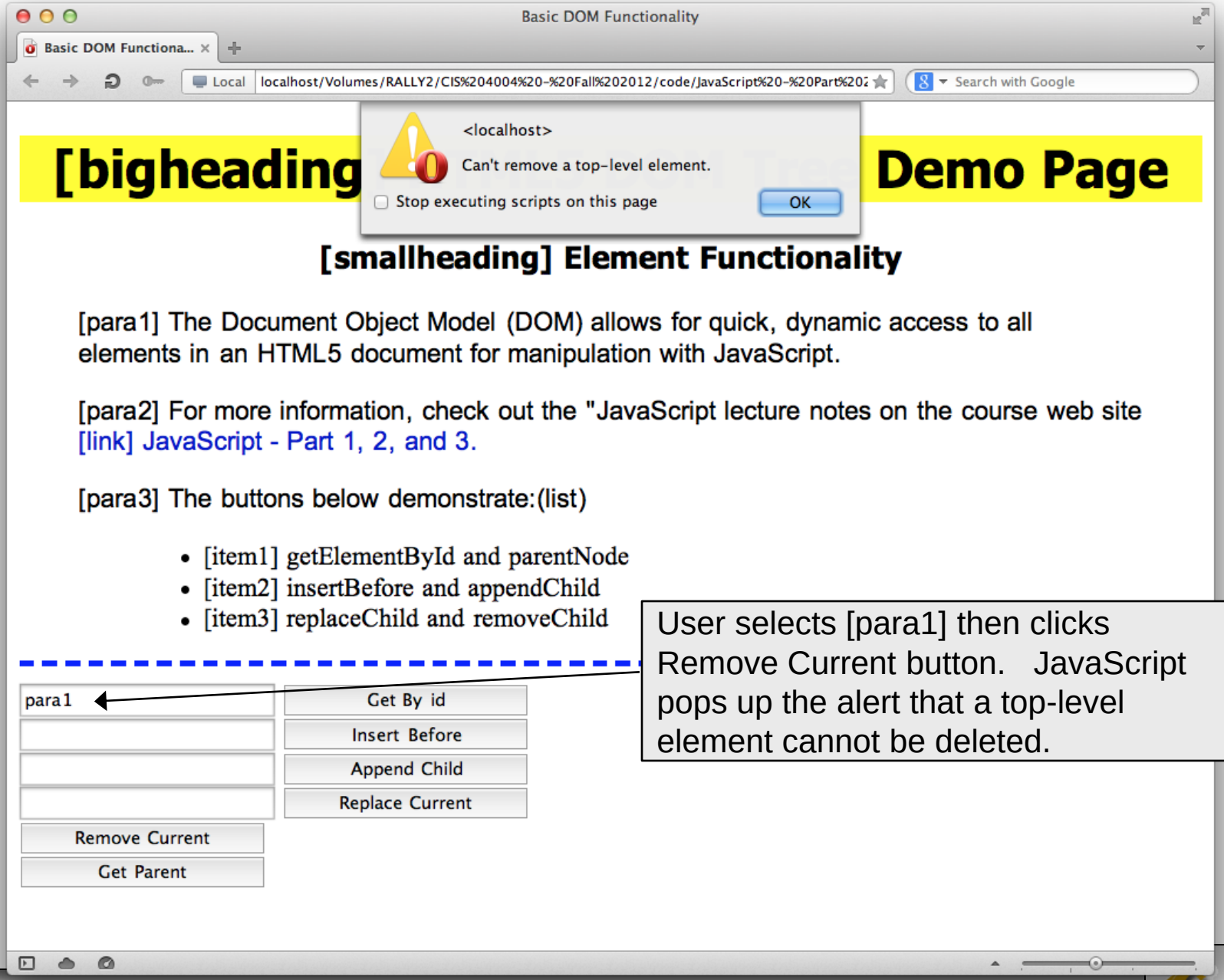
</body>
</html>
Styles
Properties
Layout
Search
Filter
accessKey ""
align ""
all HTMLCollection
attributes NamedNodeMap
baseURI "file://localhost/Volumes/RALLY…"
childElementCount 0
childNodes NodeList
children HTMLCollection
classList DOMTokenList
className "highlighted"
clientHeight 19
clientLeft 0
clientTop 0
clientWidth 558
contentEditable "inherit"
currentPage 0
currentStyle CSSStyleDeclaration
dataset DOMStringMap
dir ""
draggable false
dropzone ""
firstChild Text
html
body
p#new0.highlighted



# Replacing and Removing Elements Using `replaceChild` and `removeChild`

- Clicking the Remove Current button calls the remove function in the JavaScript which removes the currently selected element entirely and highlights the parent.
- If the node's parent is the body element, an error message is displayed to indicate that a top level element cannot be deleted.
- The next page illustrates this error condition.






User selects [para1] then clicks Remove Current button. JavaScript pops up the alert that a top-level element cannot be deleted.

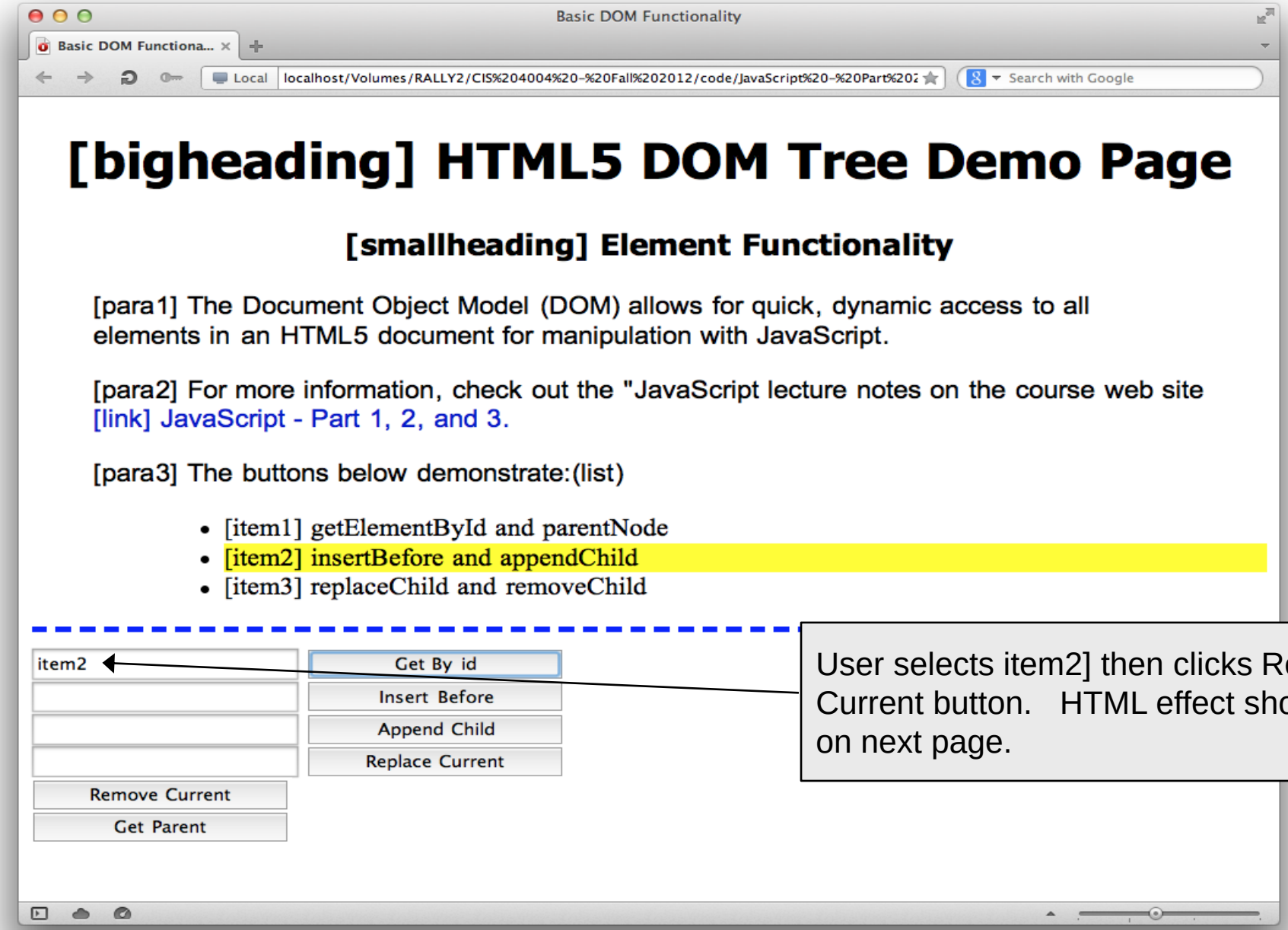
# Replacing and Removing Elements Using `replaceChild` and `removeChild`

- In general, `parent.removeChild( child )` looks in a parent's list of children for child and removes it.

dom.js

```
// remove the current node
function remove()
{
   if ( currentNode.parentNode == document.body )
      alert( "Can't remove a top-level element." );
   else
   {
      var oldNode = currentNode;
      switchTo( oldNode.parentNode );
      currentNode.removeChild( oldNode );
   }
} // end function remove
```




Basic DOM Functionality
Basic DOM Functiona...
Local
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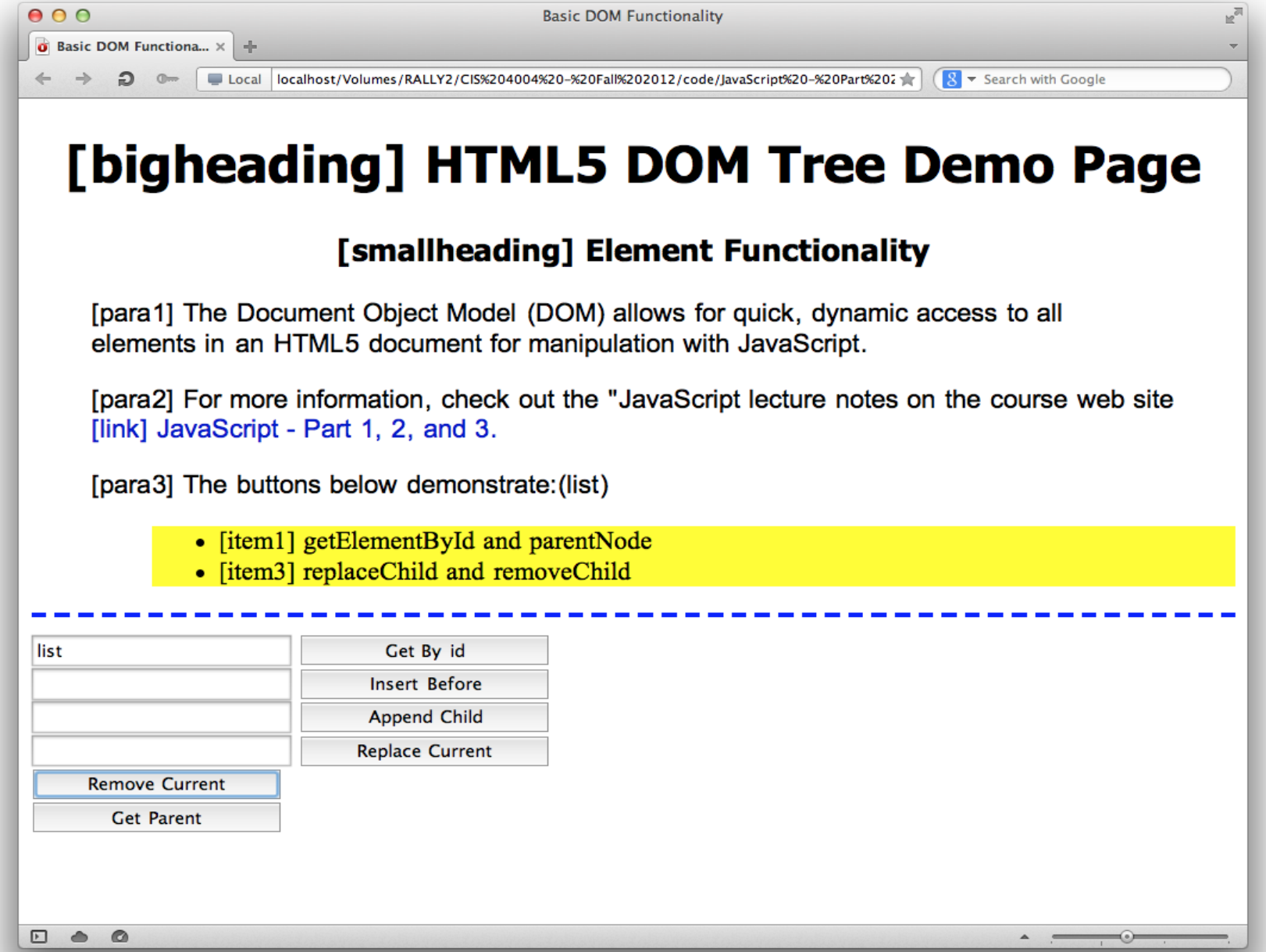
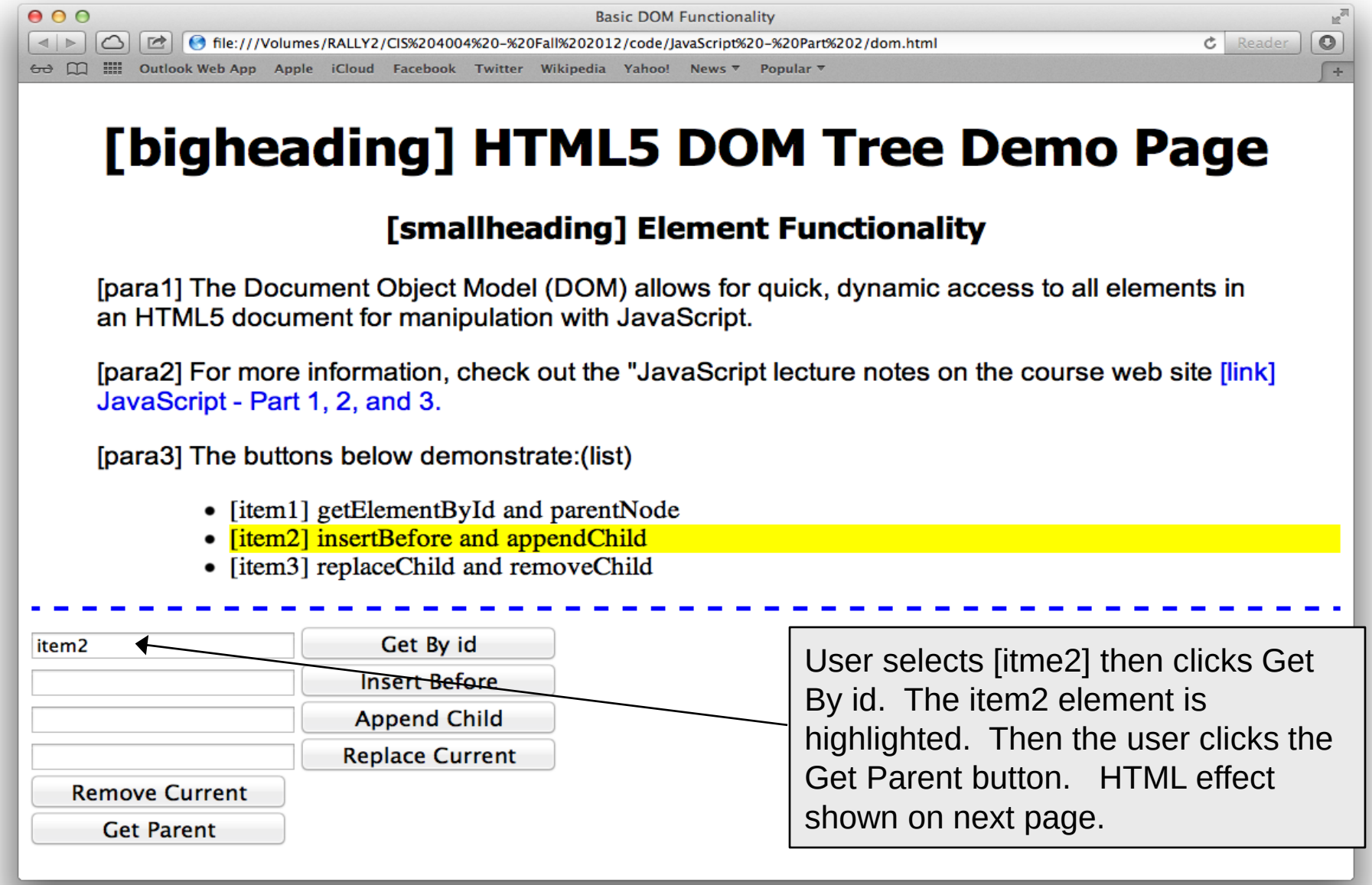
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
[item2] insertBefore and appendChild
[item3] replaceChild and removeChild
item2
Get By id
Insert Before
Append Child
Replace Current
Remove Current
Get Parent
User selects item2] then clicks Remove Current button. HTML effect shown on next page.

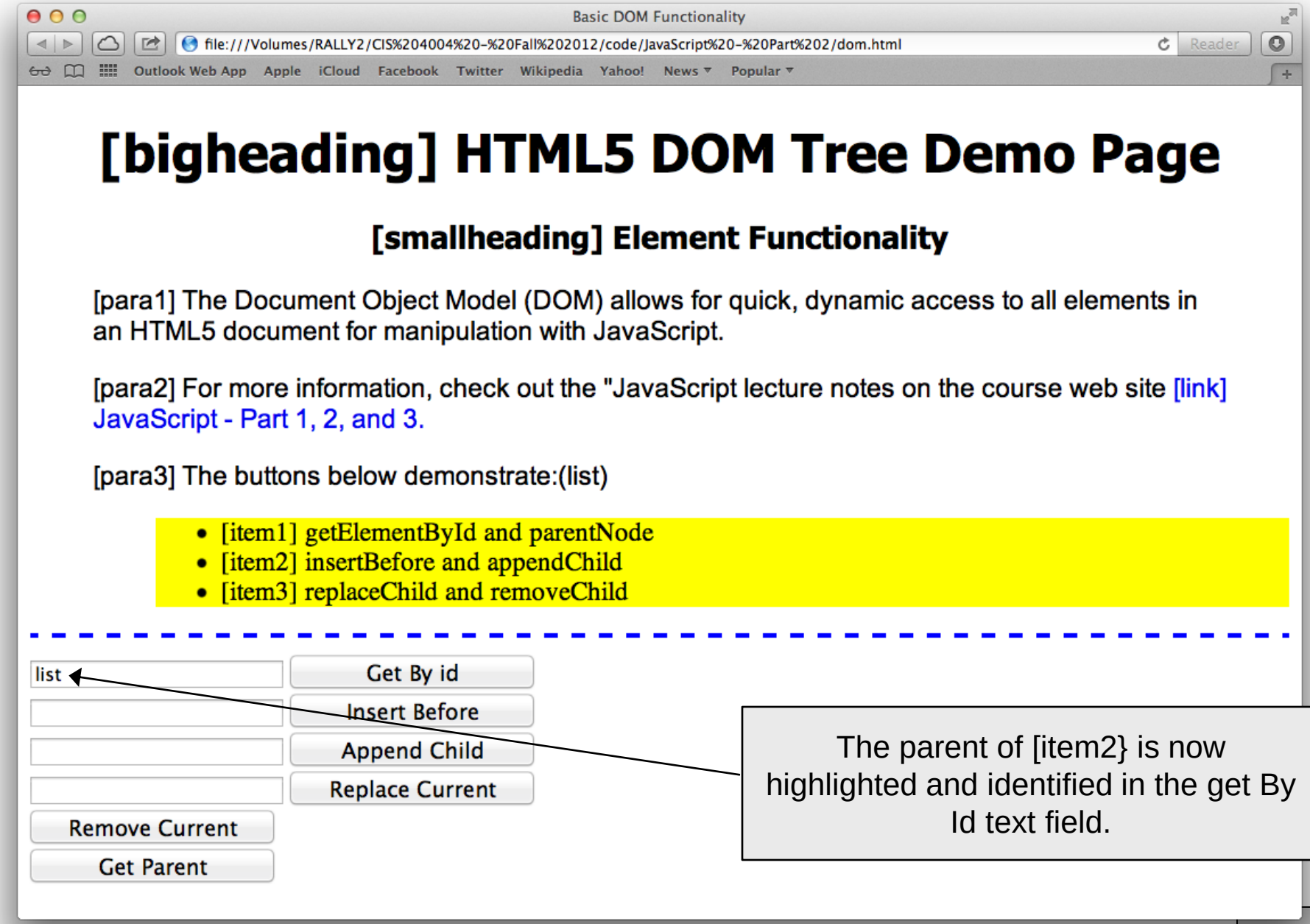

Basic DOM Functionality
Basic DOM Functiona...
Local
localhost/Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202
Search with Google
[bigheading] HTML5 DOM Tree Demo Page
[smallheading] Element Functionality
[para1] The Document Object Model (DOM) allows for quick, dynamic access to all elements in an HTML5 document for manipulation with JavaScript.
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
[item3] replaceChild and removeChild
list
Get By id
Insert Before
Append Child
Replace Current
Remove Current
Get Parent

# Determining the Parent Element

- The final piece of functionality in this DOM demo is the button that allows the user to identify the parent of the selected element.
- This is done by calling the `parent` function. This function simply gets the parent node, again making sure its not the body element since we will not allow selecting the entire body element.
- When the parent node is determined, the `switchTo` function is called to highlight the parent node.
- This sequence is illustrated by the next two slides.




Basic DOM Functionality
file:///Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202/dom.html
Reader
Outlook Web App
Apple
iCloud
Facebook
Twitter
Wikipedia
Yahoo!
News
Popular
[bigheading] HTML5 DOM Tree Demo Page
[smallheading] Element Functionality
[para1] The Document Object Model (DOM) allows for quick, dynamic access to all elements in an HTML5 document for manipulation with JavaScript.
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
[item2] insertBefore and appendChild
[item3] replaceChild and removeChild
item2
Get By id
Insert Before
Append Child
Replace Current
Remove Current
Get Parent
User selects [itme2] then clicks Get By id. The item2 element is highlighted. Then the user clicks the Get Parent button. HTML effect shown on next page.


Basic DOM Functionality
file:///Volumes/RALLY2/CIS%204004%20-%20Fall%202012/code/JavaScript%20-%20Part%202/dom.html
Reader
Outlook Web App
Apple
iCloud
Facebook
Twitter
Wikipedia
Yahoo!
News
Popular
[bigheading] HTML5 DOM Tree Demo Page
[smallheading] Element Functionality
[para1] The Document Object Model (DOM) allows for quick, dynamic access to all elements in an HTML5 document for manipulation with JavaScript.
[para2] For more information, check out the "JavaScript lecture notes on the course web site [link] JavaScript - Part 1, 2, and 3.
[para3] The buttons below demonstrate:(list)
[item1] getElementById and parentNode
[item2] insertBefore and appendChild
[item3] replaceChild and removeChild
list
Get By id
Insert Before
Append Child
Replace Current
Remove Current
Get Parent
The parent of [item2} is now highlighted and identified in the get By Id text field.