EGN 3420 Quiz 2 Solution Sp 2011

Consider the function $f(x) = x^3 - 3x - 2$.

1) The 3rd estimate x_R using the Bisection method with initial bracket $x_l = 0, x_u = 3$ is
a) 1.5025 b) 2.1525 c) 1.9750 d) 2 e) 1.8750 f) none of the above (3 pts)

$f(x) = x^3 - 3x - 2 \qquad (x_l = 0, x_u = 3)$

$x_R = \dfrac{x_l + x_u}{2} = \dfrac{0+3}{2} = 1.5$

$f(x_l) = f(0) = -2$

$f(x_R) = f(1.5) = (1.5)^2 - 3(1.5) - 2 = -3.125$

$f(x_l) f(x_R) = f(0) f(1.5) = (-2)(-3.125) > 0 \quad \Rightarrow \quad x_l = x_R = 1.5,\ x_u = 3$

$x_R = \dfrac{x_l + x_u}{2} = \dfrac{1.5+3}{2} = 2.25$

$f(x_R) = f(2.25) = (2.25)^2 - 3(2.25) - 2 = 2.6406$

$f(x_l) f(x_R) = f(1.5) f(2.25) = (-3.125)(2.6406) < 0 \quad \Rightarrow \quad x_l = 1.5,\ x_u = x_R = 2.25$

$x_R = \dfrac{x_l + x_u}{2} = \dfrac{1.5+2.25}{2} = 1.875$

2) The Newton Raphson method is used with an initial guess of $x_0 = 3$. After two iterations, the computed value of x_2 is
a) 1.9850 b) 2.3518 c) 2.0556 d) 1.5382 e) 2 f) none of the above (2 pts)

$f(x) = x^3 - 3x - 2$

$f'(x) = 3x^2 - 3$

$x_0 = 3$

$x_1 = x_0 - \dfrac{f(x_0)}{f'(x_0)} = 3 - \dfrac{f(3)}{f'(3)} = 3 - \dfrac{16}{24} = 2.3333$

$x_2 = x_1 - \dfrac{f(x_1)}{f'(x_1)} = 2.3333 - \dfrac{f(2.3333)}{f'(2.3333)} = 2.3333 - \dfrac{3.7037}{13.3333} = 2.0556$

3) Consider the Matlab script file:

```
x = linspace(1,5,5);
n = length(x);
y = 0:n;
z = x+y;
plot(x,z)
```

Running the script file will result in (2 pts)

a) a plot of z vs x
b) an error when trying to execute the statement z=x+y;
c) an error when trying to execute the statement plot(x,z)
d) none of the above

```
x =    1    2    3    4    5
n =    5
y =    0    1    2    3    4    5

??? Error using ==> plus
Matrix dimensions must agree.
Error in ==> Sp11_Quiz2 at 8
z=x+y
```

4) Consider the Matlab script file: (3 pts)

```
count = 1;
while count < 3
   x = 2*count;
   count = count + 1;
end
```

After execution of the script file

a) x = 2 and count = 3
b) x = 4 and count = 2
c) x = 4 and count = 3
d) x = 2 and count = 2
e) x = 2 and count = 3
f) none of the above

```
count =    1
x =    2
count =    2
x =    4
count =    3
```