Problem 1

Given the function $f(x) = e^{2x}$, find the second order truncated Taylor Series $f_2(x)$ expanded about the point $x_0 = 0$. Use $f_2(0.5)$ to approximate the true value $f(0.5)$. The numerical value of $f_2(0.5)$ is

a) 0 b) 1 c) 2.5 d) 2.7183 e) 3 f) none of the above (3 pts)

$$f(x) = e^{2x}, \qquad f(x_0) = e^{2x_0} = e^{2(0)} = 1$$

$$f'(x) = 2e^{2x}, \qquad f'(x_0) = 2e^{2x_0} = 2e^{2(0)} = 2$$

$$f''(x) = 4e^{2x}, \qquad f''(x_0) = 4e^{2x_0} = 4e^{2(0)} = 4$$

$$f_2(x) = f(x_0) + f'(x_0)(x - x_0) + \frac{f''(x_0)}{2!}(x - x_0)^2$$

$$= 1 + 2(x - 0) + \frac{4}{2}(x - 0)^2$$

$$= 1 + 2x + 2x^2$$

$$f_2(0.5) = 1 + 2(0.5) + 2(0.5)^2$$

$$= 2.5$$

The true error (E_T) of the estimate $f_2(0.5)$ is

a) 2.7183 b) 1.7183 c) 0 d) 0.2183 e) -0.2817 f) none of the above (2 pts)

$$E_T = f(0.5) - f_2(0.5)$$

$$= e^{2(0.5)} - 2.5$$

$$= 2.7183 - 2.5$$

$$= 0.2183$$

Problem 2

Consider the following Matlab script file:

```
x=0:2:10
y=1:6
w=x.*y
z=x+y+w
a=sum(z)/6
```

After running the script file, the numerical value of a is

a) No value because an error message will appear b) 21.3281 c) 14.7103

d) 35.2952 e) 31.8333 f) none of the above (5 pts)

```
x =    0    2    4    6    8   10

y =    1    2    3    4    5    6

w =    0    4   12   24   40   60

z =    1    8   19   34   53   76

a =   31.8333
```