MEEN 2450 | Kyan Malloy [redacted] HW 2

Exercise 1

$$f(x_{i+1}) \approx f(x_i) + f'(x_i)h + \frac{f''(x_i)h^2}{2!}$$

$f(x) = e^{-x}$ $f'(x) = -e^{-x}$ $x_{i+1} = 1$ $x_i = 0.25$ $h = 0.75$

$$f(1) \approx f(.25) + f'(.25)(0.75) + \frac{f''(0.25)(0.75)^2}{2!}$$

$f(1) \approx 0.413737916$

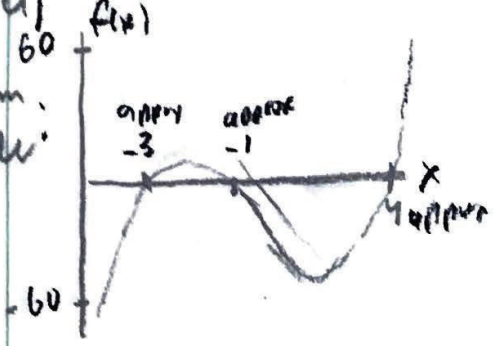
$f(1) = e^{-1} = 0.367879441\overline{2}$

$E_t = \text{True} - \text{Approx} = 0.367879441\overline{2} - 0.413737916$

$= \boxed{-0.045858}$

Exercise 2

a)



From code:

approximate roots: $-3, -1, 4$

Exercise 3

$$y(x) = \frac{w_0}{(120EIL)}(-x^5 + 2L^2x^3 - L^4x)$$

$E = 29 \times 10^4$ psi
$I = 723$ in^4
$w_0 = 3000$ lbs/ft
$L = 15$ ft

a) $$\frac{dy}{dx} = \frac{w_0}{(120EIL)}(-5x^4 + 6L^2x^2 - L^4)$$

lbs

b) $\frac{dy}{dx} = 0$ when at max deflection

Say $\frac{dy}{dx} = f(x) = \frac{w_0}{(120EIL)}(-5x^4 + 6L^2x^2 - L^4) = 0$

$$f'(x) = \frac{w_0}{(120EIL)}(-20x^3 + 12L^2x)$$

→ Using Newton Raphson solve for x value when y = max deflection