

# HOMEWORK 6

1a) APPROX. USING TRAPZOIDAL RULE

$$\int_0^5 \sqrt{x+5} dx \quad n=5$$

1b) APPROX. USING TRAPZOIDAL RULE

$$\int_0^4 \frac{e^x}{x+1} dx \quad n=8$$

2a) APPROX USING TRAPZOIDAL RULE. DETERMINE UPPER BOUND FOR THE ERROR APPROX OF  $E_1$ . LASTLY, STATE IF OVER OR UNDER APPROX.

$$\int_1^4 \frac{1}{x} dx \quad n=4$$

2b) APPROX USING TRAPZOIDAL RULE. DETERMINE UPPER BOUND FOR THE ERROR APPROX OF  $E_1$ . LASTLY, STATE IF OVER OR UNDER APPROX.

$$\int_0^{10} \sqrt{x+5} dx \quad n=10$$

$$T_n = \frac{1}{2} (1) \left[ \sqrt{5} + 2\sqrt{6} + 2\sqrt{7} + 2\sqrt{8} + 2\sqrt{9} + 2\sqrt{10} + 2\sqrt{11} + 2\sqrt{12} + 2\sqrt{13} + 2\sqrt{14} + \sqrt{15} \right]$$

$$\Delta x = \frac{10}{n} \Rightarrow \Delta x = 1$$

$$x_0 = 0 \quad x_9 = 9$$

$$x_1 = 1 \quad x_{10} = 10$$

$$x_2 = 2 \quad x_{10} = 10$$

$$x_3 = 3 \quad x_{10} = 10$$

$$x_4 = 4 \quad x_{10} = 10$$

$$x_5 = 5 \quad x_{10} = 10$$

$$x_6 = 6 \quad x_{10} = 10$$

$$x_7 = 7 \quad x_{10} = 10$$

$$f(x) = (x+5)^{1/2}$$

$$f'(x) = \frac{1}{2} (x+5)^{-1/2}$$

$$f''(x) = -\frac{1}{4} (x+5)^{-3/2}$$

$$f'''(x) = \frac{3}{8} (x+5)^{-5/2}$$

$$|f''(x)| = \frac{1}{4} (x+5)^{-3/2}$$

$$|f''(x)| = -\frac{3}{8} (x+5)^{-5/2} = NEG$$

BECAUSE IT IS ALWAYS NEG

OUR FUNCTION IS DECREASING

THEREFORE, MAX  $|f''(x)| = |f''(0)|$

$$\rightarrow \frac{1}{4} 5^{-3/2} \rightarrow \frac{1}{4} \frac{1}{\sqrt{5}} \rightarrow \frac{1}{20\sqrt{5}}$$

$$T_n = \frac{1}{2} \Delta x (f(x_0) + 2f(x_1) + 2f(x_2) + \dots + 2f(x_{n-1}) + f(x_n))$$

$$E_{10} = \left( \frac{10-0}{2009} \right) \left( \frac{(10-0)^3}{12(10)^2} \right) \rightarrow$$

$$E_n = \frac{M(b-a)^3}{12n^2} \quad M = \max |f''(x)| \text{ on } [a, b]$$

$$\rightarrow E_{10} = \frac{1}{20\sqrt{5}} \cdot \frac{1}{12} \rightarrow \boxed{E_{10} = \frac{1}{240\sqrt{5}}}$$

2a) APPROX USING TRAPZOIDAL RULE. DETERMINE UPPER BOUND FOR THE ERROR APPROX OF  $E_1$ . LASTLY, STATE IF OVER OR UNDER APPROX.

$$\int_0^1 \sin(x) dx \quad n=10$$

3) A SWIMMING POOL IS 25FT WIDE, 40FT LONG. TABLE BELOW SHOWS DEPTH OF POOL IN Y FT INTERVALS. USE TRAPZOIDAL RULE WITH  $N=10$  TO ESTIMATE VOLUME OF THE POOL.

$$V = \int_0^{40} 25 \cdot h(x) dx$$

THINGS TO MEMORIZE

TRAPZOIDAL RULE  
ERROR BOUNDS  
M

0  
4  
8  
12  
16  
20  
24  
28  
32  
36  
40