

Ibrahim Abou Zahr Sample 2

1)

$$f(x)_3 = 17.61549 \cdot \frac{(x-8.3)(x-8.6)(x-8.7)}{(8.1-8.3)(8.1-8.6)(8.1-8.7)}$$

$$+ 17.56492 \cdot \frac{(x-8.1)(x-8.6)(x-8.7)}{(8.3-8.1)(8.3-8.6)(8.3-8.7)}$$

$$+ 18.50515 \cdot \frac{(x-8.1)(x-8.3)(x-8.7)}{(8.5-8.1)(8.5-8.3)(8.6-8.7)}$$

$$+ 19.2091 \cdot \frac{(x-8.1)(x-8.3)(x-8.6)}{(8.7-8.1)(8.7-8.3)(8.7-8.6)}$$

$$f(8.4)_3 = 17.61549 \cdot \frac{(8.4-8.3)(8.4-8.6)(8.4-8.7)}{(8.1-8.3)(8.1-8.6)(8.1-8.7)}$$

$$= 17.61549 \cdot \frac{(-0.1)(-0.2)(-0.3)}{(-0.2)(-0.5)(-0.6)} + 17.56492 = 67.211149$$

$$17.56492 \cdot \frac{(-0.1)(-0.2)(-0.3)}{(-0.2)(-0.3)(-0.4)} + = (-4.477319)$$

$$18.50515 \cdot \frac{(-0.1)(-0.1)(-0.3)}{(0.5)(0.3)(0.1)} + = (-4.477319)$$

$$19.2091 \cdot \frac{(-0.1)(0.1)(-0.2)}{(0.6)(0.4)(0.1)} = -0.445527$$

$$= 17.87716 \quad (b)$$

$$2) L_0 f(x_0) + L_1 f'(x_1) + L_2 f''(x_2)$$

$$L_0 = \frac{(x - 1.02)(x - 1.04)}{(1.000 - 0.983)(1.000 - 0.9794)}$$

$$= \frac{(x - 1.02)(x - 1.04)}{(0.017)(0.0216)}$$

$$= \frac{(x - 1.02)(x - 1.04)}{1.2542 \times 10^{-4}}$$

$$L_1 = \frac{(x - 1.00)(x - 1.04)}{(0.984 - 1.000)(0.993 - 0.9794)}$$

$$= \frac{(x - 1.00)(x - 1.04)}{-1.248 \times 10^{-4}}$$

$$L_2 = \frac{(x - 1.00)(x - 1.02)}{(0.9794 - 1.000)(0.9794 - 0.985)}$$

$$= \frac{(x - 1.00)(x - 1.02)}{2.0736 \times 10^{-4}}$$

$$\Rightarrow \frac{(x - 1.02)(x - 1.04)}{1.2542 \times 10^{-4}} (1.000) + \frac{(x - 1.00)(x - 1.04)}{-1.248 \times 10^{-4}} (0.985) + \frac{(x - 1.00)(x - 1.02)}{2.0736 \times 10^{-4}} (0.993)$$

~~f(1.02)~~ $f(1.01) = 1321.667 + 0.9933 \textcircled{c}$
 without ≈ 2.37647

3) Table.

x	$f(x)$	b_1	1st	2nd	3rd
8.0	2.079		$\frac{f_1 - f_0}{x_1 - x_0} = 0.113$		
9.0	2.197		$= 0.193$		
9.5	2.251		$= 0.093$		
11.0	2.390				

$$f_3(x) = b_1 + b_2(x - x_1) + b_3(x - x_1)(x - x_2) + b_4(x - x_1)(x - x_2)(x - x_3)$$

$$f_3(x) = 2.079 + 0.113(x - 8) + 0.166(10^{-3})(x - 8)(x - 9) \\ + 1.6644(10^{-3})(x - 8)(x - 9)(x - 11)$$

$$f(9.2) = 2.22071 \approx 2.219 \quad (c)$$

$$4) \quad a=0 \quad b=\frac{3\pi}{8} \quad n=6$$

$$n = \frac{b-a}{h} = \frac{1}{16}\pi = 0.1963445403$$

$$\delta = \frac{\frac{1}{16}\pi}{3} [0 + 2(\tan(\frac{11}{16}\pi)) + 4(\tan(\frac{1}{8}\pi)) \\ + 2(\tan(\frac{3}{16}\pi)) + 4(\tan(\frac{1}{4}\pi)) \\ + 2(\tan(\frac{5}{16}\pi)) + 4(\tan(\frac{3}{8}\pi))]$$

$$\delta = 7.177630923 \lambda 10^{-3} + 0.05403738 \\ \approx 0.90055 = (d)$$

5)

$$\int_1^2 2x \, dx$$

 $n=5$

$$h = \frac{b-a}{n} = \frac{2-1}{5} = \frac{1}{5}$$

$$F = \frac{1}{5} \left[a + 2(t^{1.2} + t^{1.4} + t^{1.6} + t^{1.8}) + c \right] \quad \begin{array}{c} \longleftrightarrow \\ 1.2 \ 1.4 \ 1.6 \ 1.8 \end{array} \quad 2$$

$$F = 0.23333187289$$

d)

$$h=1$$

$$\int_0^2 \sin(x)^2 \, dx$$

$$n+1=7$$

$$h = \frac{2}{6} = \frac{1}{3}$$

$$\begin{array}{c} \longleftrightarrow \\ 0 \ \frac{1}{3} \ \frac{2}{3} \ 1 \ \frac{4}{3} \ \frac{5}{3} \end{array} \quad 2$$

$$\begin{aligned} & \frac{1}{3} \left[\sin(0)^2 + 2\left(\sin\left(\frac{1}{3}\right)^2\right) + 4\left(\sin\left(\frac{2}{3}\right)^2\right) + 2\left(\sin(1)^2\right) + 4\left(\sin\left(\frac{4}{3}\right)^2\right) \right. \\ & \quad \left. + 4\left(\sin\left(\frac{5}{3}\right)^2\right) + 2\left(\sin(2)^2\right) \right] \end{aligned}$$

$$\delta =$$

7)

	x	1	2	3	4
	f(x)	1.5	2.5	4.5	

$$L_0 f(x_0) + L_1 f(x_1) + L_2 f(x_2)$$

$$L_0 = \frac{(x-2)(x-3)}{(1-2)(1-3)} = \frac{(x-2)(x-3)}{2}$$

$$L_1 = \frac{(x-1)(x-3)}{(2-1)(2-3)} = \frac{(x-1)(x-3)}{-1}$$

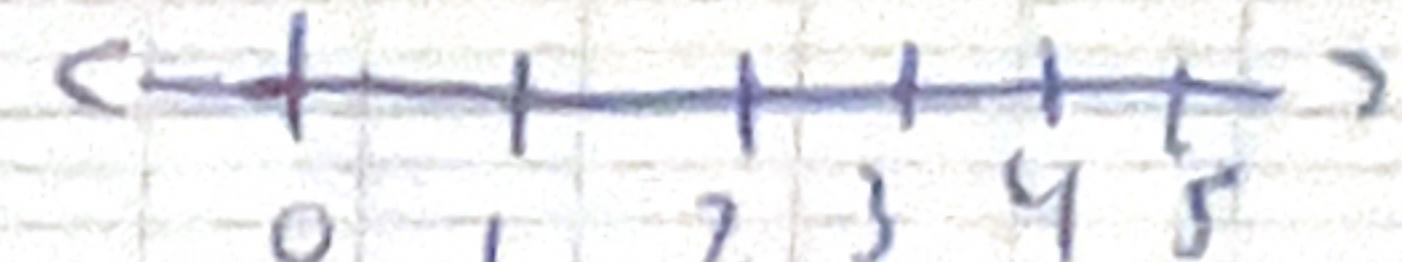
$$L_2 = \frac{(x-1)(x-2)}{(3-1)(3-2)} = \frac{(x-1)(x-2)}{2}$$

$$\frac{(x-2)(x-3)}{2}(1.5) + \frac{(x-1)(x-3)}{-1}(2.5) + \frac{(x-1)(x-2)}{2}(4)$$

$$f(2.1) = 2.655 \textcircled{a}$$

g) $f(x) = \int_0^5 \frac{\sin(x)}{x} \quad n=5$

$$h = \frac{5}{5} = 1$$



$$\frac{1}{2} \left[\frac{\sin(0)}{0} + 2 \left[\frac{\sin(1)}{1} + \frac{\sin(2)}{2} + \frac{\sin(3)}{3} + \frac{\sin(4)}{4} \right] + \frac{\sin(5)}{5} \right]$$

$$\frac{1}{2} \left[\frac{\sin(5)}{5} + 0.1395731489 + \frac{\sin(5)}{5} \right] = 0.5785 \dots \textcircled{b}$$

\textcircled{b}

$$-7x_0 = -50$$

$$x_0 =$$

$$\frac{10-x}{0.4-0.9} = \frac{5}{7}; \quad \frac{10-x}{-0.5} = 20$$

$$12x = 20$$

$$-x = -10$$

$$x = 10$$

x	f(x)	1st DA	2nd DA
0.0	1		
0.4	3	$f[x_0, x_1]$	$\frac{50}{7}$
0.7	6	10	$\frac{50}{7}$

$$\frac{6-x}{0.4-0.9} = 10$$

$$\frac{6-x}{0.3} = 10; \quad 6-x = 3$$

$$-x = -3$$

$$\frac{3-x}{0.4-0.9} = \frac{50}{7}; \quad [x=3]$$

$$21-7x = 20$$

$$-7x = -1$$

$$x = \frac{-1}{7}$$