

MATH 425

1 a. $(0.4, 10.2) (3.1, 4.8)$

$$\frac{10.2 - 4.8}{0.4 - 3.1} = \frac{5.4}{-2.7} = -2$$

b. $(1.3, 11.7) (2.5, 8.5)$

$$\frac{11.7 - 8.5}{1.3 - 2.5} = \frac{3.2}{-1.2} = -\frac{8}{3}$$

c. $(1.8, 11.1) (2.0, 10.5)$

$$\frac{11.1 - 10.5}{1.8 - 2.0} = \frac{0.6}{-0.2} = -3$$

d.

zero because it has stopped moving upward and its slope is zero

2. a. $\lim_{x \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f(x) = 3 + \frac{2}{x-5}$

$$\frac{3 + \frac{2}{(x+h)-5} - 3 + \frac{2}{x-5}}{h} = \frac{\frac{2}{h-5} - \frac{2}{x-5}}{h}$$

$$\frac{\frac{2}{h-5} - \frac{2}{x-5}}{h} = \frac{2}{h-5} \cdot \frac{1}{h} - \frac{2}{x-5} \cdot \frac{1}{h} = \frac{2}{h^2-5h} - \frac{2}{(x-5)h}$$

$$\frac{2}{h^2-5h} - \frac{2}{(x-5)h} = \frac{2}{h} \left(\frac{1}{h-5} - \frac{1}{x-5} \right)$$

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b. $\lim_{t \rightarrow 3^-} \left(\frac{4t-7}{3t-2} \right) = \frac{8-7}{9-2} = \frac{1}{7}$

$$\frac{4(0.666) - 7}{3(0.666) - 2} = \frac{2.668 - 7}{2.000 - 2} = \frac{-4.332}{0} = -\infty$$

c. $\lim_{\theta \rightarrow 0^+} (2 \ln \theta \sin \theta)$

$$\left(\frac{1}{\theta} \right) (\sin \theta) + (\ln \theta) (\cos \theta) = \frac{\sin \theta}{\theta} + \frac{\ln \theta}{\sec \theta} \rightarrow \frac{0}{0} + \frac{0}{1} = 0$$

3.

a. $\lim_{x \rightarrow -1^-}$ and $\lim_{x \rightarrow -1^+}$ do not match, jump discontinuity

b. $t=8$ is on a sharp corner

c. 3 is not an absolute maximum, 4 is at $t=11$

d. it is decreasing and is concave upward

e. yes point separates concave upward to concave downward

f. a. $-2^3 = -8$

b. $17 - 5e^2 \rightarrow 17 - 5(7.39) \rightarrow 17 - 36.95 = -19.95$

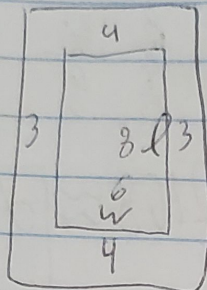
c. $\ln 4 + 3(3)(\frac{1}{2}) \rightarrow 1.39 + 4.5 = 5.89$

d. $\frac{4(2)}{\pi} - \sin(\pi) \rightarrow \frac{8}{\pi} - 0 = 2.55$

e. $\pi + \frac{1}{3}$ is undefined

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5. a.



$$48 = (l+8)(w+6)$$

$$lw + 6l + 8w + 48 = 48$$

$$\quad \quad \quad -48 \quad -48$$

$$lw + 6l + 8w = 0$$

$$A = 48 \text{ in}^2$$

~~12" x 16"~~

b. $P'(t) = e^t(e^{-t} + 7) + 3t^2$

$$e^t(e^{-t}) 7e^t$$

$$P(t) = e^{t+7}$$

$$e^t \rightarrow e^t$$

$$1 + 7e^t + 3t^2$$

$$x \quad 7e^t \quad t^3 + C$$

$$C = 1993$$

$$P(t) = x + 7e^t + t^3 + C$$

$$P(t) = \cancel{x} t + 7e^t + t^3 + 1993$$