Math 119 HW #3

Section 3.4 #11, 13, 17, 39

Section 3.5 #8

3.4 #11 $f(x) = 3x - 7$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{3(x+h)-7-(3x-7)}{h}$$

$$= \lim_{h\to 0} \frac{3x+3h-7-3x+7}{h} = \lim_{h\to 0} \frac{3h}{h} = 3$$

$f'(-2) = 3 \quad f'(0) = 3 \quad f'(5) = 3$

3.4 #13 $f(x) = -4x^2 + 9x + 2$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{-4(x+h)^2+9(x+h)+2-(-4x^2+9x+2)}{h}$$

$$= \lim_{h\to 0} \frac{-4(x^2+2xh+h^2)+9x+9h+2+4x^2-9x-2}{h}$$

$$= \lim_{h\to 0} \frac{-4x^2-8xh-4h^2+9x+9h+2+4x^2-9x-2}{h} = \lim_{h\to 0} \frac{-8xh-4h^2+9h}{h}$$

$$= \lim_{h\to 0} -8x-4h+9 = -8x+9$$

$f'(-2) = -8\cdot -2 + 9 = 16 + 9 = 25$, etc.

3.4 # 19 $f(x) = 2x^3 + 5$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{2(x+h)^3 + 5 - (2x^3+5)}{h}$$

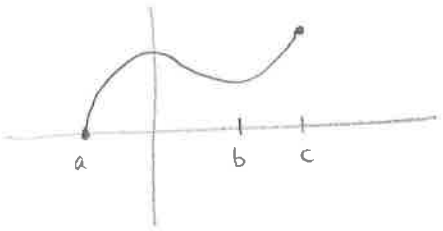
$$= \lim_{h\to 0} \frac{2(x+h)(x^2+2xh+h^2) + 5 - 2x^3 - 5}{h} = \lim_{h\to 0} \frac{2(x^3+2x^2h+h^2x+hx^2+2xh^2+h^3) - 2x^3}{h}$$

$$= \lim_{h\to 0} \frac{2x^3+3x^2h+3xh^2+h^3) - 2x^3}{h} = \lim_{h\to 0} \frac{2x^3+6x^2h+6xh^2+2h^3 - 2x^3}{h}$$

$$= \lim_{h\to 0} 6x^2 + 6xh + 2h^2 = \underline{6x^2}$$

$f'(-2) = 6(-2)^2 = 6 \cdot 4 = \underline{24}$

3.4 # 39

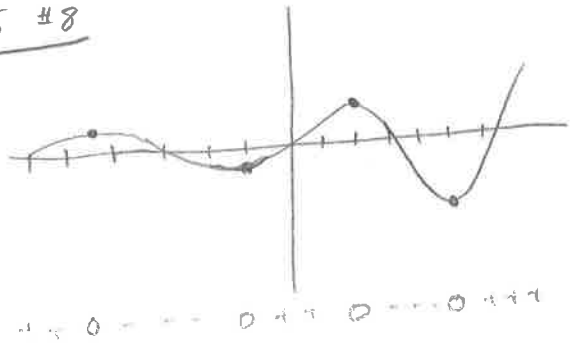


a) $f'(x) > 0$ on $(a,0)$ and (b,c)

b) $f'(x) < 0$ on $(0,b)$

c) $f'(x) = 0$ at $x = 0$, $x = b$.

3.5 # 8



$f(x)$

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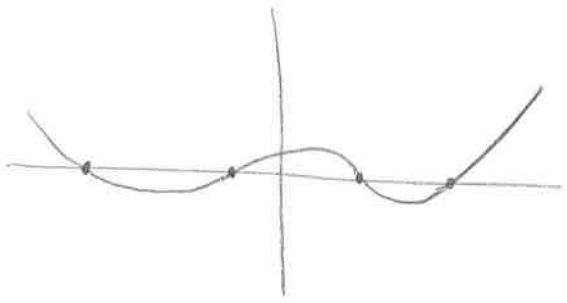

$f'(x)$