Math 121 HW #7

Section 3.3 # 18, 29c Section 3.5 # 8
Section 3.4 # 13, 19b

3.3 #18 $F(x) = x^2 + 2$, rate of change at $x = 0$

$$\lim_{h\to 0} \frac{F(a+h) - F(a)}{h} = \lim_{h\to 0} \frac{F(0+h) - F(0)}{h} = \lim_{h\to 0} \frac{h^2+2-2}{h} = \lim_{h\to 0} \frac{h^2}{h} = \lim_{h\to 0} h = \underline{0}$$

3.3 #29c $P(x) = 2x^2 - 5x + 6$, rate of chge at $x = 3$

$$\lim_{h\to 0} \frac{P(a+h) - P(a)}{h} = \lim_{h\to 0} \frac{P(3+h) - P(3)}{h} = \lim_{h\to 0} \frac{2(3+h)^2 - 5(3+h) + 6 - (2\cdot 3^2 - 5\cdot 3 + 6)}{h}$$

$$= \lim_{h\to 0} \frac{2(9 + 6h + h^2) - 15 - 5h + 6 - 9}{h}$$

$$= \lim_{h\to 0} \frac{18 + 12h + 2h^2 - 15 - 5h + 6 - 9}{h} = \lim_{h\to 0} \frac{2h^2 + 7h}{h} = \lim_{h\to 0} 2h + 7 = \underline{7}$$

3.4 #13 $f(x) = \frac{12}{x}$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h\to 0} \frac{\frac{12}{x+h} - \frac{12}{x}}{h} = \lim_{h\to 0} \frac{1}{h}\left(\frac{12}{x+h} - \frac{12}{x}\right)$$

$$= \lim_{h\to 0} \frac{1}{h}\left(\frac{12x - 12(x+h)}{x(x+h)}\right) = \lim_{h\to 0} \frac{1}{h}\left(\frac{\cancel{12x} - \cancel{12x} - 12h}{x(x+h)}\right)$$

$$= \lim_{h\to 0} \frac{-12}{x(x+h)} = \frac{-12}{x\cdot x} = -12/x^2$$

3.4 #19b Eqn of tangent line of $f(x)=x^2+2x$ at $x=3$

The slope is $f'(3)$:

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

$$=\lim_{h\to 0}\frac{9+6h+h^2+6+2h-15}{h}=\lim_{h\to 0}\frac{8h+h^2}{h}=\lim_{h\to 0}8+h=8$$

x value is 3,

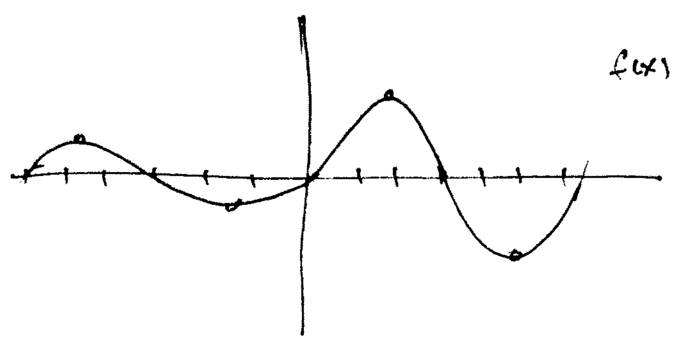
y value is $f(3)=3^2+2\cdot 3=15$,

so pt-slope form: $y-15=8(x-3)$

$y-15=8x-24$

$\underline{y=8x-9}$

3.5 #8



draw $f'(x)$:

$f'(x)$: + 0 − 0 | + 0 − 0 +