Math 126, in-class exercise 6 on derivatives via limits: Name: ______________________________.

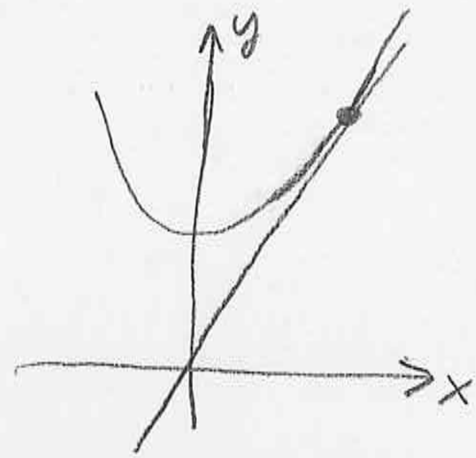
1.) Let $f(x) = x^2 + 3$. Calculate $f'(1)$ and write the equation for the tangent line at x=1. Sketch the graph of the function and the tangent line to check for consistency of your work.

$$f'(1) = \lim_{h\to 0}\left[\frac{f(1+h) - f(1)}{h}\right] = \lim_{h\to 0}\left(\frac{(1+h)^2 + 3 - 4)}{h}\right)$$

$$= \lim_{h\to 0}\left[\frac{2h+h^2}{h}\right]$$

$$= \lim_{h\to 0}(2+h)$$

$$= \boxed{2}$$



Since $f(1) = 4$ we find tang. line

$$y = 4 + 2(x-1)$$

$$y = 2x$$

2.) Let $f(x) = 1/x^2$. Calculate $f'(-1)$ and write the equation for the tangent line at x=-1. Sketch the graph of the function and the tangent line to check for consistency of your work.

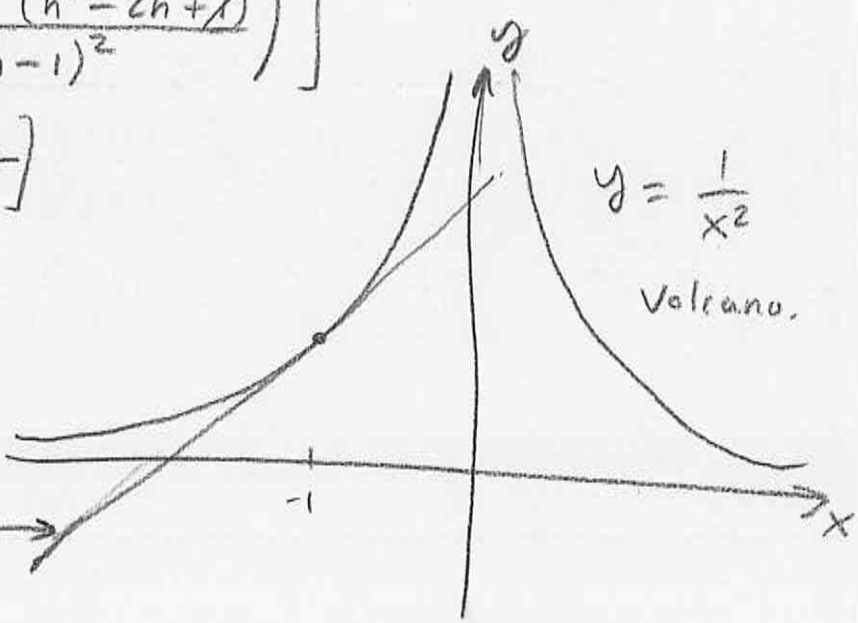
$$f'(-1) = \lim_{h\to 0}\left(\frac{\frac{1}{(-1+h)^2} - \frac{1}{(-1)^2}}{h}\right)$$

$$= \lim_{h\to 0}\left(\frac{1}{h}\left(\frac{1}{(h-1)^2} - \frac{(h-1)^2}{(h-1)^2}\right)\right)$$

$$= \lim_{h\to 0}\left[\frac{1}{h}\left(\frac{\cancel{1} - (h^2 - 2h + \cancel{1})}{(h-1)^2}\right)\right]$$

$$= \lim_{h\to 0}\left[\frac{-h+2}{(h-1)^2}\right]$$

$$= \boxed{2.}$$



$\boxed{y = 1 + 2x}$

tangent to $(-1,1)$
for $y = 1/x^2$