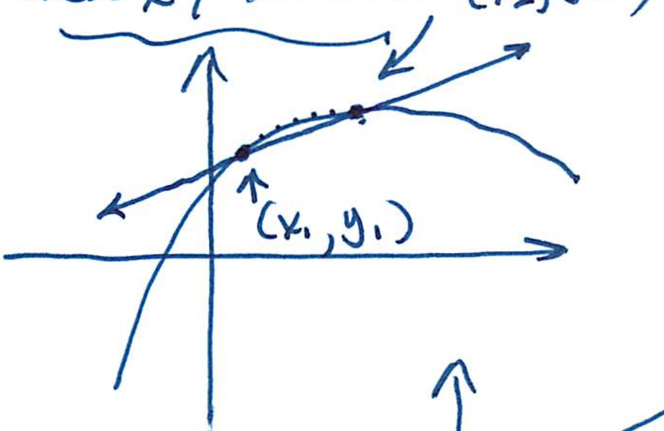
MA 121 - 002

Thursday, January 10

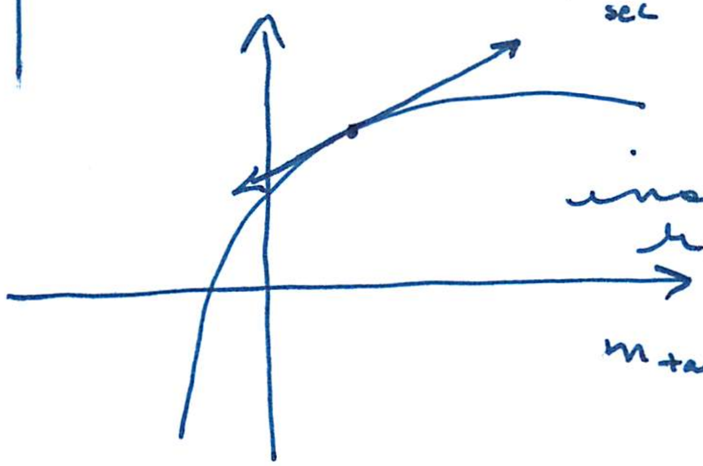
calculus?

- max / min.



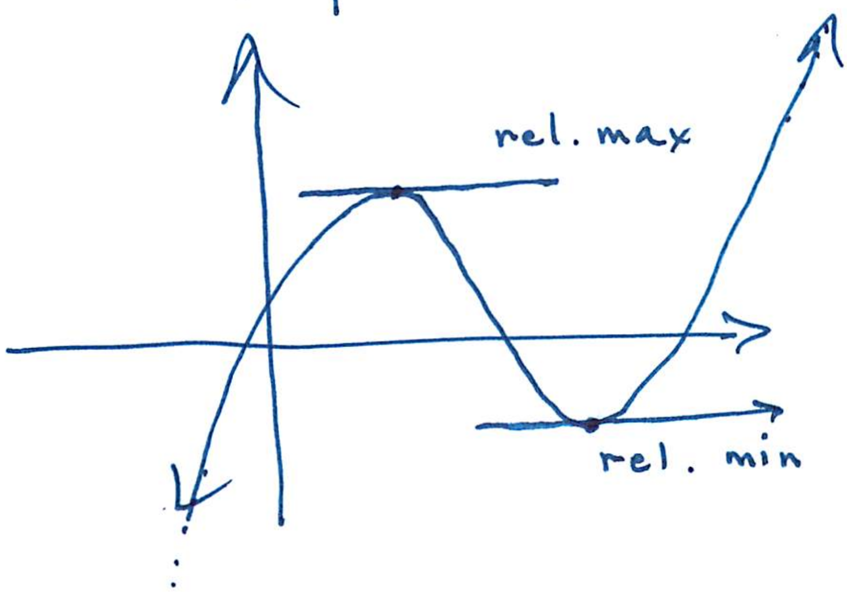
average rate of change:

$$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$



instantaneous rate of change:

m_{tan}



$m_{tan} = 0$

Chapter R:

$\boxed{\text{linear}}$ equations:

$m = \frac{\text{rise}}{\text{run}} = \boxed{\frac{y_2 - y_1}{x_2 - x_1} = \frac{m}{1}}$

$x_1 \quad y_1$

$\boxed{(2, 4)}$ & $(-1, 8)$

$m = \frac{8-4}{-1-2} = \frac{4}{-3} = -\frac{4}{3}$

$y_2 - y_1 = m(x_2 - x_1)$

$y - y_1 = m(x - x_1)$

(pt-slope form)

$3(y-4) = \frac{-4}{\cancel{3}}(x-2)\cdot\cancel{3}$

$3(y-4) = -4(x-2)$

$3y - 12 = -4x + 8$

$\rightarrow 4x + 3y - 20 = 0$

$4(-1) + 3(8) - 20 \stackrel{?}{=} 0$

solve for y:

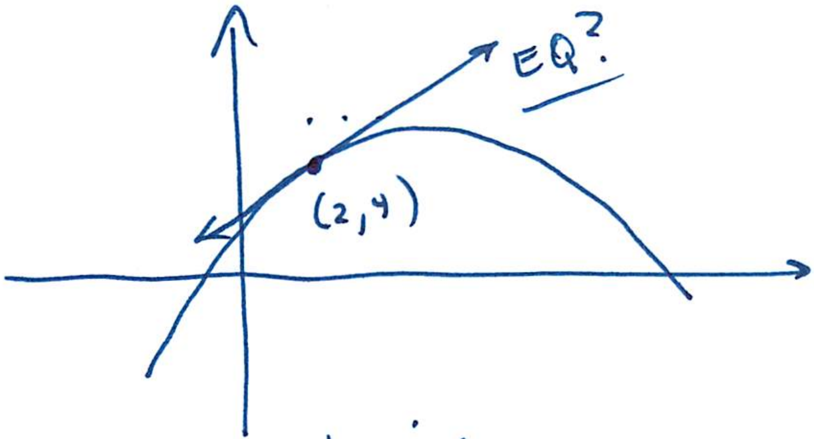
$4x + 3y - 20 = 0$

$\frac{3y}{3} = \frac{-4x}{3} + \frac{20}{3}$

$y = -\frac{4}{3}x + \frac{20}{3}$

$y = mx + b$

y-int



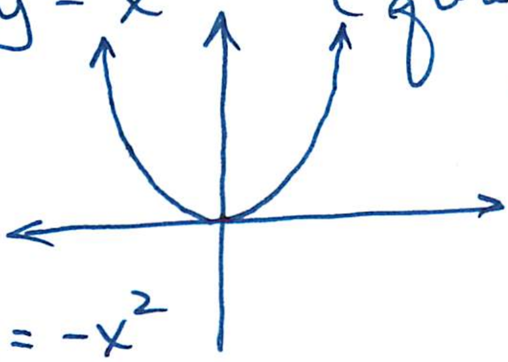
Find the equation of the line tangent to the curve at the given point. $\underline{m_{TAN}} = \frac{1}{2}$

$$y - y_1 = m(x - x_1)$$
$$y - 4 = \frac{1}{2}(x - 2)$$

Parabolas:

$y = x^2$ (quadratic)

vertex: $(0,0)$



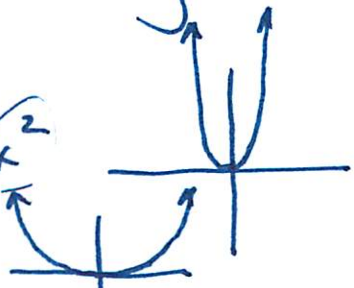
$y = -x^2$

$y = -x^2 + 4$

changes:

$y = x^2 - 3$

$y = x^2 + 5$



$y = \underline{3}x^2$

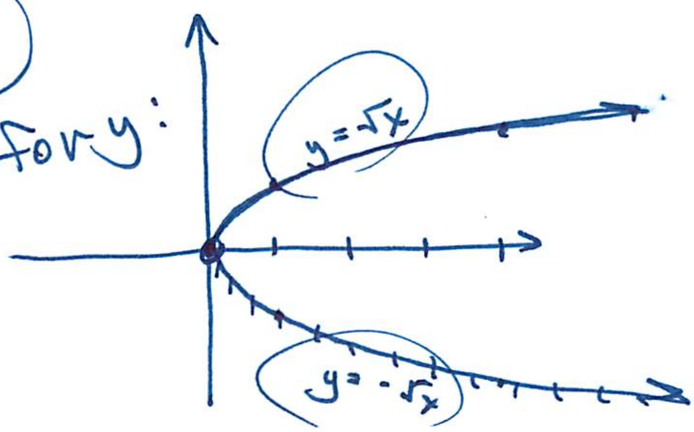
$y = \frac{1}{4}x^2$

$y = x^2$

$x = y^2$

x	y
0	0
1	1
1	-1
4	2
4	-2

solve for y:



non-function

$t = 3$

(3, 100ft.)

~~(3, 88 ft.)~~

$y^2 = x$

$y = \pm\sqrt{x}$ → $y = \sqrt{x}$ → $y = -\sqrt{x}$

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

comp. interest

P: initial \$

r: int. rate (yr.)

t: time (yr.)

n: # of comp. prds

A: future \$

$$A = \boxed{10{,}000}\left(1+\frac{.015}{4}\right)^{\boxed{4(18)}}$$

$$A = \$13{,}093.^{02}$$

LIMIT

$$A = P\cdot e^{rt}$$

contin. comp. int.

$$A = (10{,}000)\cdot e^{(.015)(18)} \quad n \to \infty$$

$$A = \$13{,}099.^{64}$$

$(-x)^2 = x^2$

$$f(x) = -1x^2 + 3x + 5$$

x: input

f(x): output

$(x, f(x))$

$$f(1) = -(1)^2 + 3(1) + 5$$

$$f(1) = -1 + 3 + 5 = 7$$

$(1, 7)$

$$f(a) = -(a)^2 + 3(a) + 5$$

$$f(a) = -a^2 + 3a + 5$$

$(a, -a^2 + 3a + 5)$

$$f(x+h) = -\boxed{(x+h)^2} + 3(x+h) + 5$$

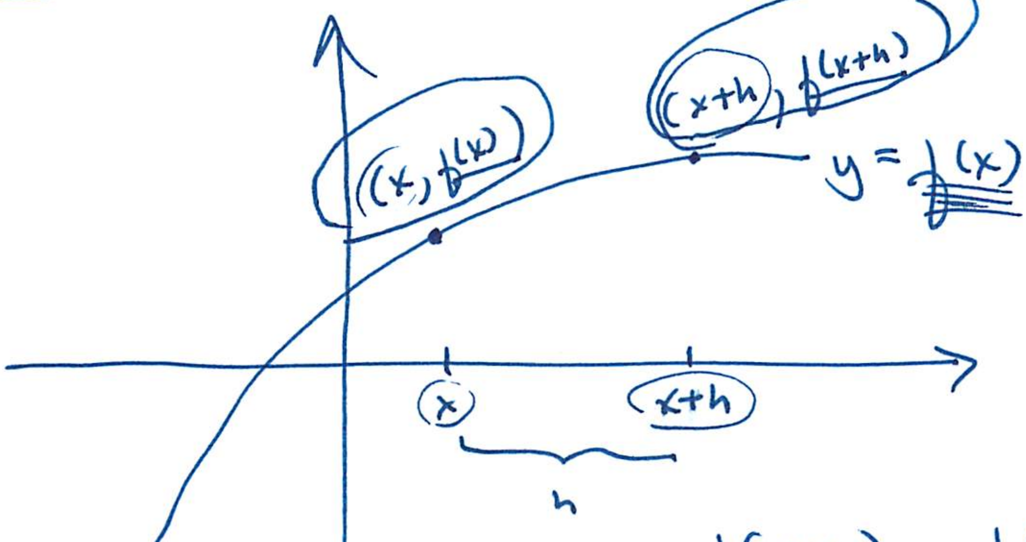
$$= -(x^2 + 2xh + h^2) + 3x + 3h + 5$$

$$= -x^2 - 2xh - h^2 + 3x + 3h + 5$$

$(x+h, -x^2 - 2xh - h^2 + 3x + 3h + 5)$

difference quotient $\boxed{\dfrac{f(x+h) - f(x)}{h}} = \dfrac{f(x+h) - f(x)}{(x+h) - (x)}$

$$\frac{\boxed{f(x+h)} - f(x)}{\boxed{(x+h)} - x} = m \quad \text{slope}$$



$$m = \frac{f(x+h) - f(x)}{(x+h) - x}$$

find $\dfrac{f(x+h)-f(x)}{h} = \dfrac{f(x+h)-f(x)}{h}$

for $f(x) = -x^2 + 3x + 5$

$f(x+h) = -x^2 - 2xh - h^2 + 3x + 3h + 5$

$$\frac{(\cancel{-x^2} - 2xh - h^2 + \cancel{3x} + 3h + \cancel{5}) - (\cancel{-x^2+3x+5})}{h} \qquad \cancel{+x^2} \cancel{-3x} \cancel{-5}$$

$$\frac{\cancel{h}^{1}(-2x - h + 3)}{\cancel{h}_{1}} = -2x - h + 3$$

$(h \neq 0)$