Limits: Review

e) $\lim_{x \to 1^-} \frac{|x-1|}{x^2-1}$

$\lim_{x \to 1^-} \frac{|x-1|}{(x-1)(x+1)}$

$= \frac{|0.999\ldots - 1|}{(0.999\ldots - 1)(2)}$ $-0.00\ldots 1$

-1

$= \frac{|0|}{(0)(2)} = \frac{-1}{2}$

Warm Up

Given that $f(x) = -2x^2 + 5x - \sqrt{x}$, determine the value of...

(1) $f(4)$ (2) $f(\$)$ (3) $f(9+h)$

$= -2(4)^2 + 5(4) - \sqrt{4}$

$= -32 + 20 - 2$

$= -14$

$= -2\$^2 + 5\$ - \sqrt{\$}$

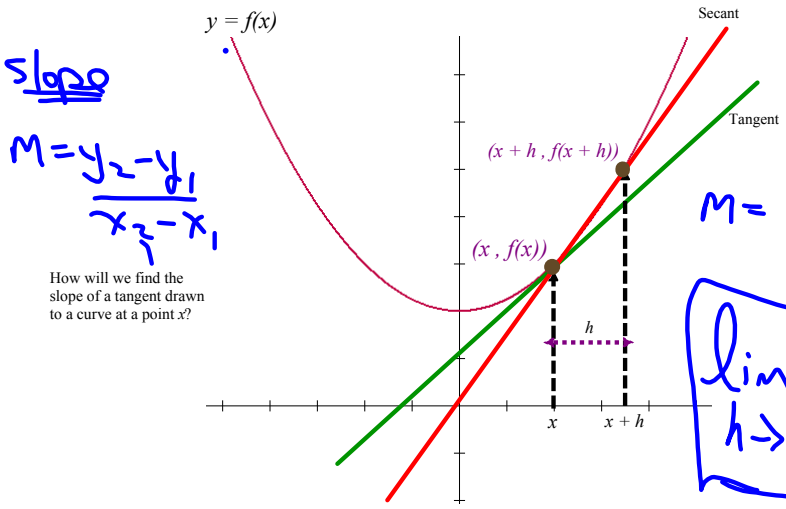
(3) $f(9+h) = -2(9+h)^2 + 5(9+h) - \sqrt{9+h}$

$= -2(81 + 18h + h^2) + 45 + 5h - \sqrt{9+h}$

$= -117 - 31h - 2h^2 - \sqrt{9+h}$

~~Tangents~~, Velocities, and Rates of Change

Slope of a tangent to a curve:



How will we find the slope of a tangent drawn to a curve at a point x?

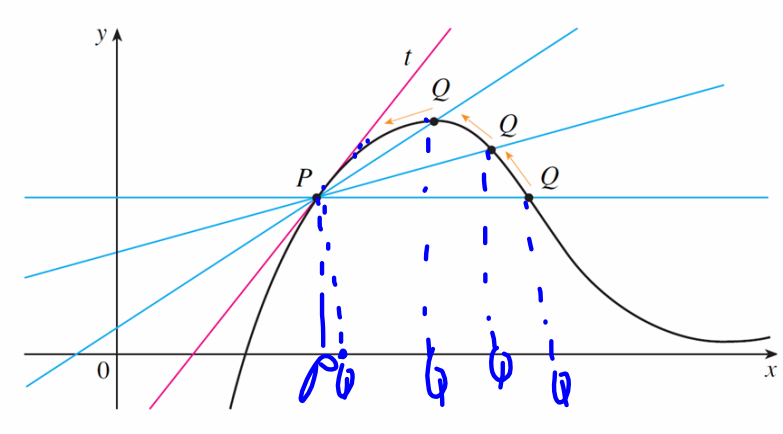
slope

$m = \frac{y_2 - y_1}{x_2 - x_1}$

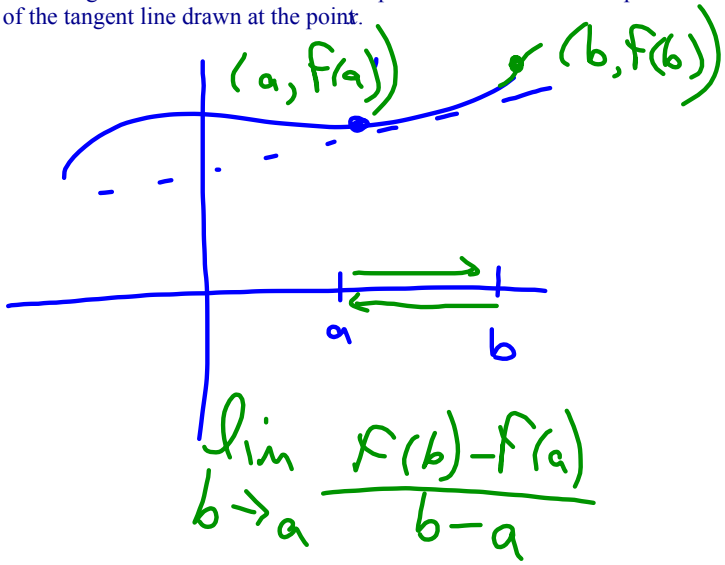
$m = \frac{f(x+h) - f(x)}{(x+h) - x}$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

How will the slope of this secant become a better approximation for the slope of the tangent line?



Use your knowledge of limits to determine an expression for that would represent the slope of the tangent line drawn at the point x.



$\lim_{b \to a} \frac{f(b) - f(a)}{b - a}$

Example:

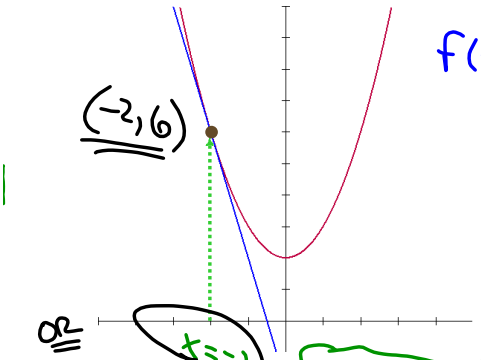
Determine the equation of the tangent line drawn to the curve $y = x^2 + 2$ at the point $x = -2$.

point & slope $\begin{cases} y - y_1 = m(x - x_1) \\ y = mx + b \end{cases}$

$f(x) = x^2 + 2$

$f(x+h) = (x+h)^2 + 2$

$= x^2 + 2xh + h^2 + 2$



OR

$x = -2$

$\lim_{h \to 0} \frac{f(-2+h) - f(-2)}{h}$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

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

$\lim_{h \to 0} \frac{2xh + h^2}{h}$

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

Slope at $x = -2$

$m = 2x$

$\downarrow$

$m = 2(-2)$

$m = -4$

Equation:

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

$y - 6 = -4(x + 2)$

$y = mx + b$

OR $Ax + By + C = 0$ Standard form

$A > 0$

A, B, C can Not be fractions

$y - 6 = -4x - 8$

$y = -4x - 2$

OR

$4x + y + 2 = 0$

Find equation of the tangent to $f(x)=\sqrt{x+7}$ at $x=2$

slope $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$f(x+h)=\sqrt{x+h+7}$

$\lim_{h\to 0}\frac{\sqrt{x+h+7}-\sqrt{x+7}}{h}\left(\frac{\sqrt{x+h+7}+\sqrt{x+7}}{\sqrt{x+h+7}+\sqrt{x+7}}\right)$

$\lim_{h\to 0}\frac{(x+h+7)-(x+7)}{h\left(\sqrt{x+h+7}+\sqrt{x+7}\right)}$

$m=\frac{1}{2\sqrt{x+7}}$

at $x=2$ . . . $f(x)=\sqrt{x+7}$

$m=\frac{1}{2\sqrt{2+7}}$ $f(2)=\sqrt{2+7}$

$=3$

$m=\frac{1}{6}$ $(2,3)$

$y=mx+b$

$3=\frac{1}{6}(2)+b$ (6)

$18=2+6b$

$\frac{16}{6}=\frac{6b}{6}$

$\frac{8}{3}=b$

$y=\frac{1}{6}x+\frac{8}{3}$

Homework:

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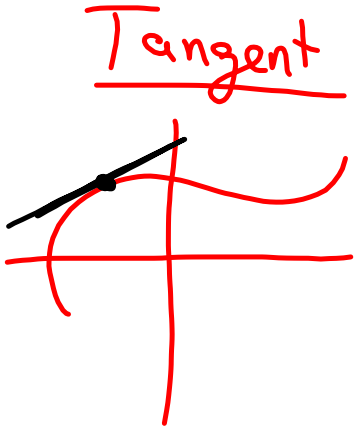
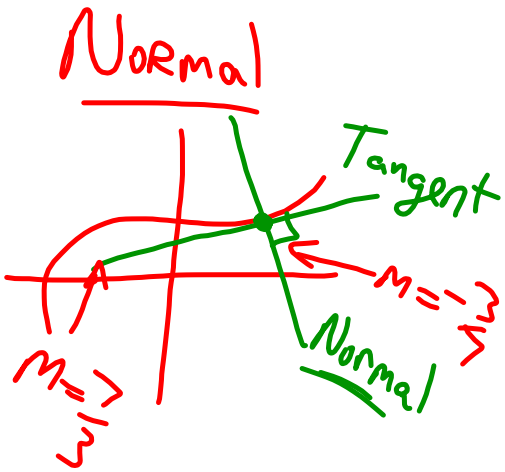
#7 (i), (ii), (iv) and (v)





Attachments

Worksheet - Sketching Angles in Radians.doc

Warm-Up - Intro to Limits.docx

Review - Factoring.pdf

Worksheet - Factoring Review.doc