Find the equation of the tangent line to the following curves:
Hint: Find the slope of the tangent line (IROC) first.

a) $y = x - x^3$ **at x = -1**

$f(-1) = -1 - (-1)^3$
$= -1 - (-1)$
$= 0$ $(-1, 0)$

$\lim_{x \to -1} \frac{f(x) - f(-1)}{x - (-1)}$

$\lim_{x \to -1} \frac{x - x^3 - 0}{x + 1}$

$\lim_{x \to -1} \frac{x(1 - x^2)}{x + 1}$

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

$m = -1(1 - (-1))$
$= -1(2)$
$m = -2$

$y = mx + b$
$0 = -2(-1) + b$
$0 = 2 + b$
$b = -2$

$y = -2x - 2$

Calculus 120
Unit 1: Rate of Change and Derivatives

February 6, 2019: Day #5

1. Quiz

2. Assignments Due

Jan 9-1:43 PM

Curriculum Outcomes

C1. Explore the concepts of average and instantaneous rate of change.

Jan 24-9:32 AM

Determine the equation of the tangent line to the hyperbola $y = \frac{1}{x}$ at the point (-2, -1/2).

$$\lim_{x \to -2} \frac{f(x) - f(-2)}{x - (-2)}$$

$$\lim_{x \to -2} \frac{\frac{1 \cdot 2}{x \cdot 2} + \left(+\frac{1}{2}\right)\frac{x}{x}}{x+2}$$

$$\lim_{x \to -2} \frac{\frac{2}{2x} + \frac{x}{2x}}{x+2}$$

$$\lim_{x \to -2} \left(\frac{2+x}{2x}\right)\left(\frac{1}{x+2}\right)$$

$$\lim_{x \to -2} \frac{1}{2x}$$

$$m = -\frac{1}{4}$$

$m = -\frac{1}{4}$ $P\left(-2, -\frac{1}{2}\right)$

$y = mx + b$

$-\frac{1}{2} = -\frac{1}{4}(-2) + b$

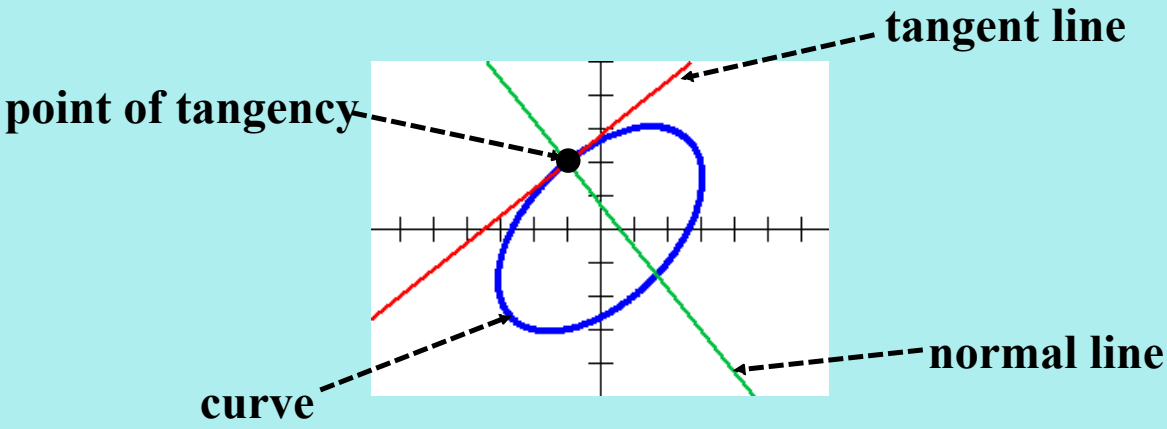
$-\frac{1}{2} = \frac{1}{2} + b$

$-1 = b$

$y = -\frac{1}{4}x - 1$

Normal Lines

The normal line to a curve at a point is the line perpendicular to the tangent at that point.



Remember from NRF....Perpendicular lines have slopes which are negative reciprocal (flip fraction; change sign)

Ex: For the function $f(x) = 4 - x^2$ ....

a) Determine the slope of the tangent line at x = 1.

b) Determine the equation of the tangent line at this point.

c) Determine the equation of the normal line at this point.

a) $\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1}$

$= \lim_{x \to 1} \frac{4 - x^2 - 3}{x - 1}$

$= \lim_{x \to 1} \frac{-x^2 + 1}{x - 1}$

$= \lim_{x \to 1} \frac{-1(x^2 - 1)}{x - 1}$

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

$m = -1(2)$

$m = -2$

$f(1) = 4 - 1^2$

$f(1) = 3$

b) $y = mx + b$ $m = -2$ $P(1, 3)$

$3 = -2(1) + b$

$3 = -2 + b$

$b = 5$

$y = -2x + 5$

c) $m_\perp = \frac{1}{2}$ $P(1, 3)$

$y = mx + b$

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

$3 = \frac{1}{2} + b$

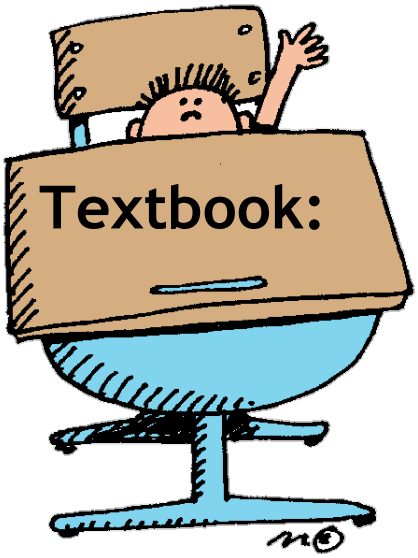
$\frac{5}{2} = b$

$y = \frac{1}{2}x + \frac{5}{2}$

Find the equation of the specified normal line to the following curve:

$$y = \frac{2}{x+1}$$ **at x = -2**

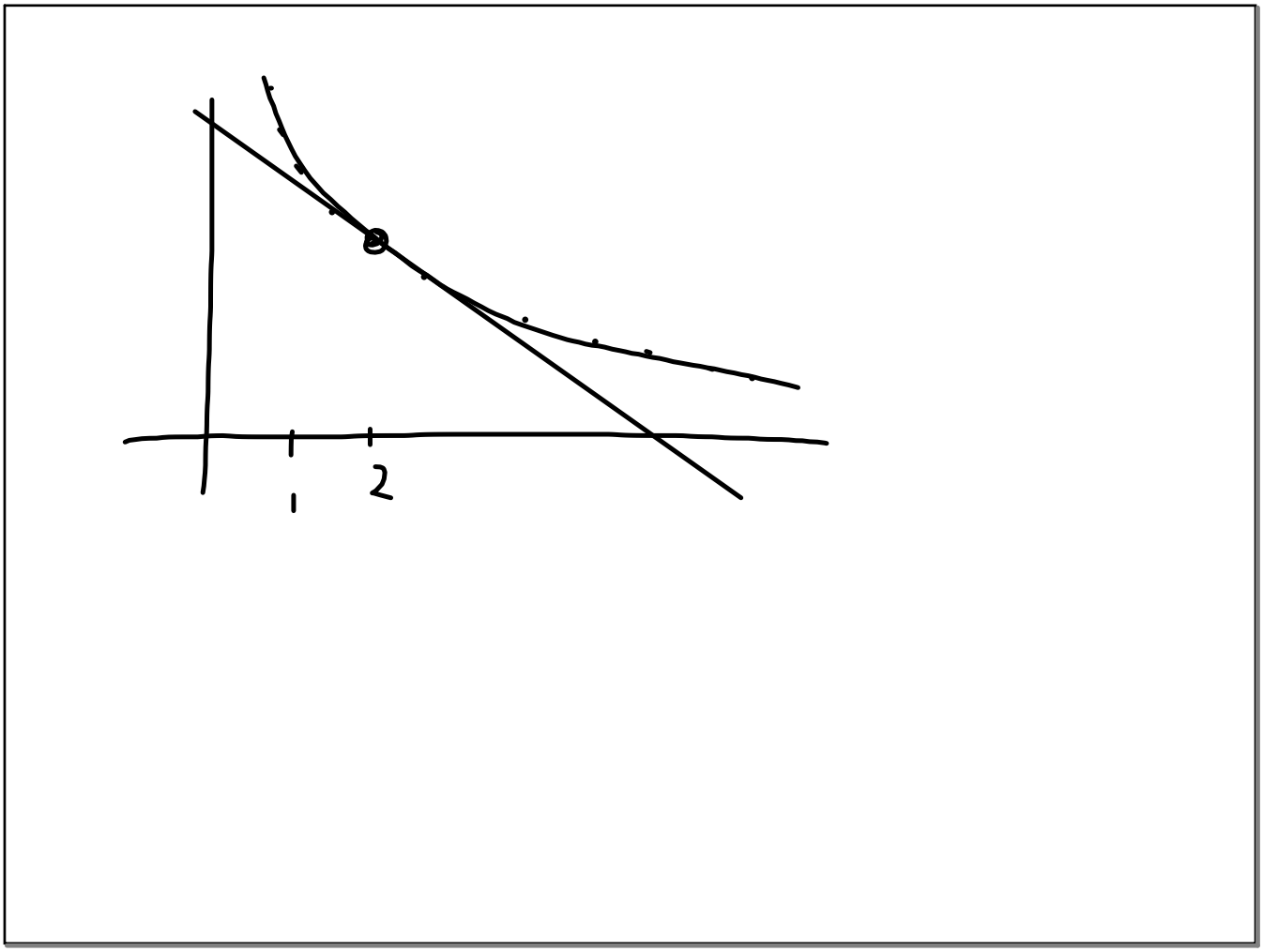
Feb 4-10:46 AM



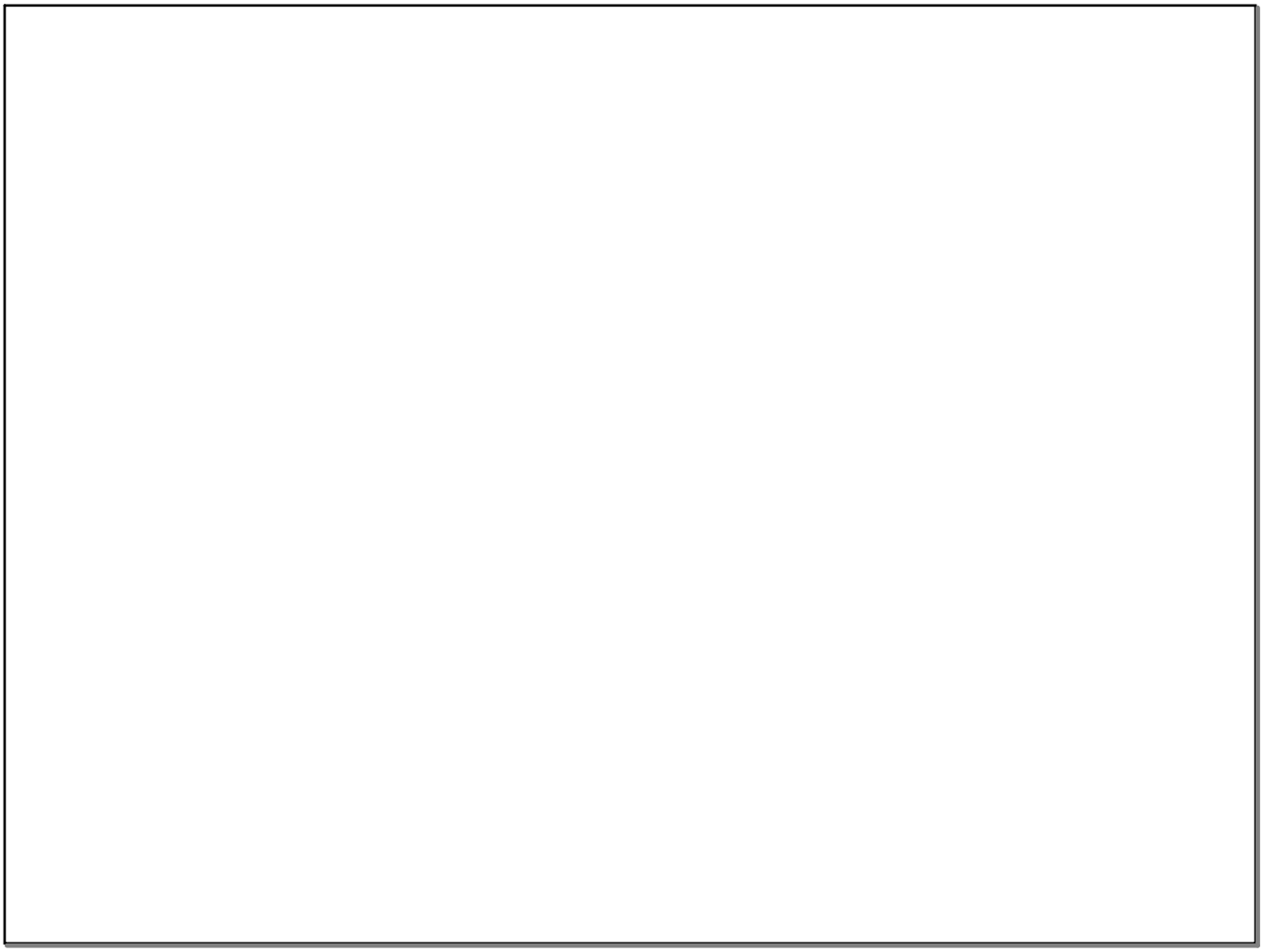
Practice

Page 92-93 #1a, 5a, 9, 10
11, 12, 23, 27, 29, 31

Jan 13-9:38 PM



Feb 11-1:43 PM



Feb 4-3:38 PM

Attachments

2.1_74_AP.html

2.1_74_AP.swf

2.1_74_AP.html