Lecture 1

(16,-12) & (-8,-15) Equation: $y = \frac{1}{8}x\mathbf{-14}$ x-int: (112 , 0) y-int: (0 , -14)

$$m = \frac{-15-(-12)}{-8-16} = \frac{-3}{-24} = \frac{1}{8} \rightarrow y-(-12) = \frac{1}{8}(x-16) \rightarrow y+12 = \frac{1}{8}x - 2$$

6x – 7 + 3y = 9x – 2y + 8 → 5y = 3x + 15 → $\boldsymbol{y = \frac{3}{5}x + 3}$

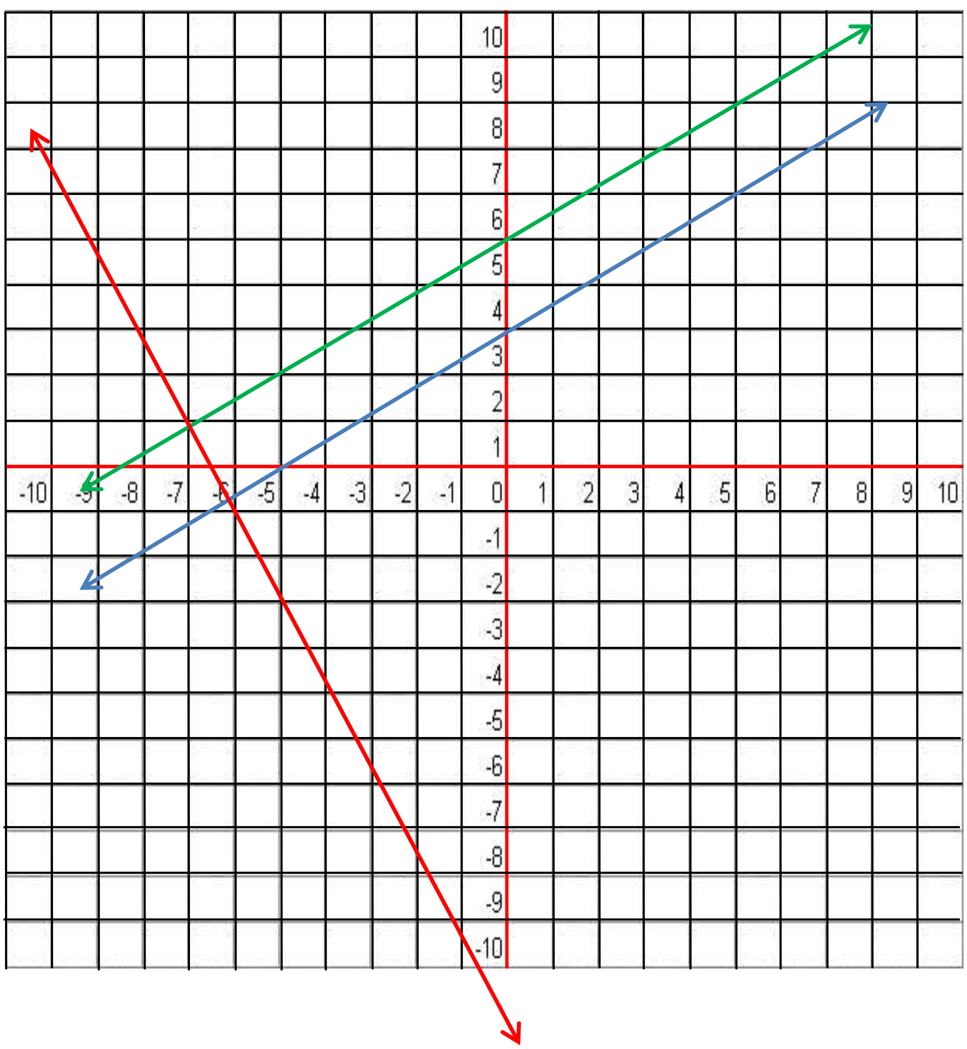
x-int: (–5 , 0) y-int: (0 , 3)

Parallel to (–5,2): $y - 2 = \frac{3}{5}(x-(-5))$ → $y - 2 = \frac{3}{5}x + 3$ → $\boldsymbol{y = \frac{3}{5}x + 5}$

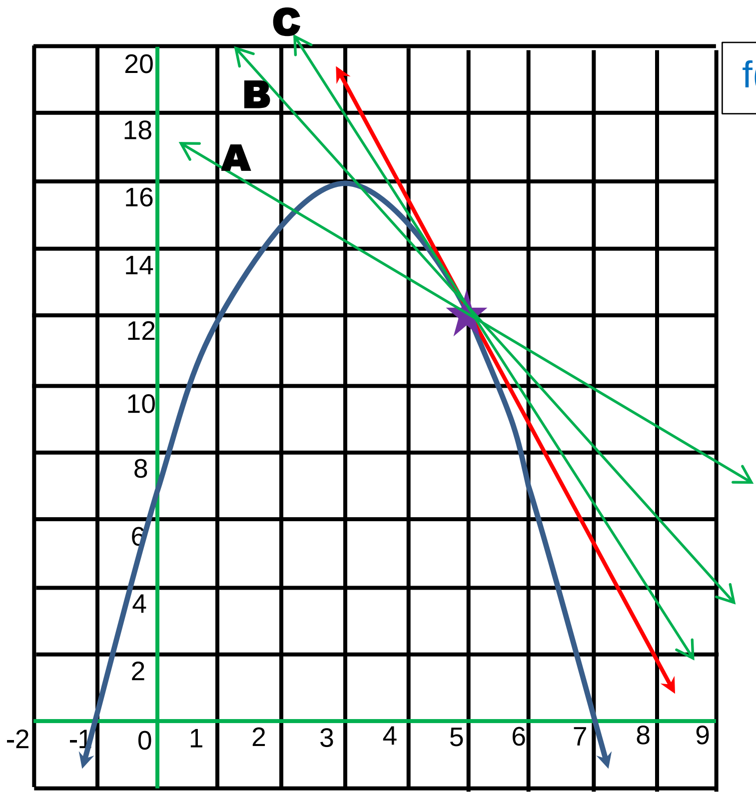
x-int: $\left(-\frac{25}{3}, 0\right)$ y-int: (0 , 5)

Perpendicular to (-9,4): $y - 4 = -\frac{5}{3}(x-(-9))$ → $y - 4 = -\frac{5}{3}x - 15$ → $\boldsymbol{y = -\frac{5}{3}x - 11}$

x-int: $\left(-\frac{33}{5}, 0\right)$ y-int: (0 , –11)



Lecture 1 (continued)



$f(x) = -x^2 + 6x + 7$

To find the slope of our red line:

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

Where $f(x) = -x^2 + 6x + 7$, so

$f(x+h) = -(x+h)^2 + 6(x+h) + 7$

$$m = \lim_{h\to 0} \frac{-(x+h)^2 + 6(x+h) + 7 - (-x^2 + 6x + 7)}{h}$$

$$m = \lim_{h\to 0} \frac{-(x^2 + 2xh + h^2) + 6(x+h) + 7 - (-x^2 + 6x + 7)}{h}$$

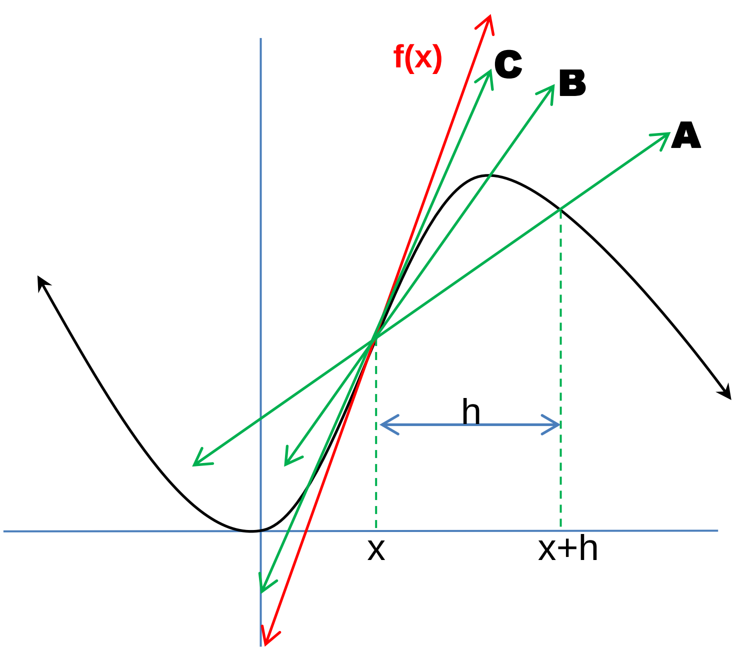
$$m = \lim_{h\to 0} \frac{-x^2 - 2xh - h^2 + 6x + 6h + 7 + x^2 - 6x - 7}{h}$$

$m = \lim_{h\to 0} \frac{-2xh - h^2 + 6h}{h}$ →factor out the common 'h' on top:

$m = \lim_{h\to 0} \frac{h(-2x - h + 6)}{h}$ → cancel the 'h' top and bottom:

Apply the limit (that is, let h=0): $m = (-2x - 0 + 6)$

So, our slope is: **$m = -2x + 6$**, for any x we choose



Slope of **f(x)**:

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

-OR-

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

As h gets smaller (from **A** to **B** to **C**), the green line slope gets closer to matching the red line slope. When h = 0, the green line becomes the red line. The problem is that h ≠ 0, or we have a zero denominator, so we cheat and define the red line slope as:

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