Linear Models
(graphs of lines)
and *Direct Variation*
(x varies directly with y)
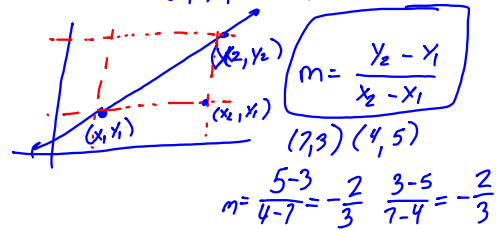
X	Y
0	3
1	4
2	5
3	6

$y = x + 3$

X	Y
1	2
2	4
3	6
4	8

$y = 2x$

X	Y
2	0
4	1
6	2
8	3

$y = \frac{1}{2}x - 1$

$y = mx + b$ Slope – Intercept

$m = slope = \dfrac{rise}{run}$

(4,2) $m = \frac{1}{3}$ (1,1) 3

$m = \frac{3}{1} = 3$
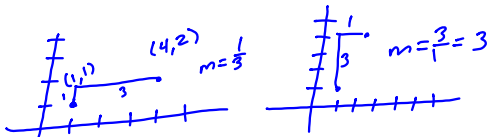
I have two points
$(x_1, y_1)\ (x_2, y_2)$

(x_2, y_2)
(x_1, y_1)

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

$(7,3)\ (4,5)$

$m = \dfrac{5-3}{4-7} = -\dfrac{2}{3}$ $\dfrac{3-5}{7-4} = -\dfrac{2}{3}$

Slope
+ (growth)
– (decay)

$y = \frac{1}{3}x + 2$

$$y = -\frac{2}{3}x - \frac{4}{3}$$
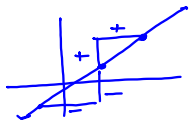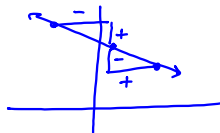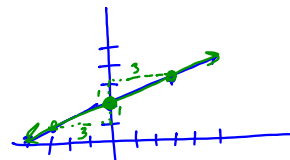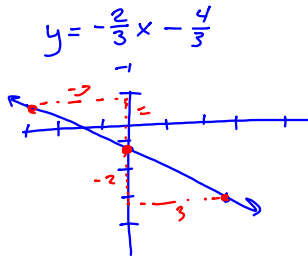
Given two points $(7,3)$ $(4,5)$

$y = mx + b$ Write an equation of Line

1. Find slope $m = \frac{5-3}{4-7} = -\frac{2}{3}$

2. Plug in one (x, y) and slope
   to find the vertical intercept
   $y = mx + b$
   $5 = -\frac{2}{3}(4) + b$ multiply by 3
   $15 = -2(4) + 3b$ add 8
   $\frac{23}{3} = \frac{3b}{3}$ $b = \frac{23}{3}$ $y = -\frac{2}{3}x + \frac{23}{3}$

$(8, 2)$ $(6, 6)$

1. Slope $m = \frac{6-2}{6-8} = -2$

2. $(6,6)$ $m = 2$

$6 = -2(6) + b$ $2 = -2(8) + b$
$6 = -12 + b$ $2 = -16 + b$
$18 = b$ $18 = b$
$y = -2x + 18$ $y = -2x + 18$

Direct Variation

$k = $ slope

$y = kx$

$y = mx + b$

same quotient

$\frac{y}{x} = k$ $\frac{y}{x} \approx k$