

P.2 Linear Models and Rates of Change

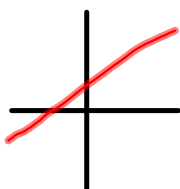
Slope = rise over run

$$= \frac{\text{change in } y}{\text{change in } x}$$

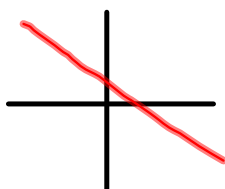
$$= \frac{\Delta y}{\Delta x} = \frac{dy}{dx}$$

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

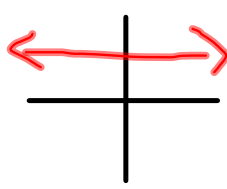
positive m



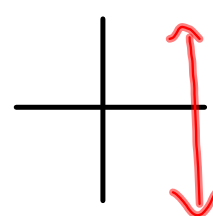
negative m



zero m



no slope



Slope-intercept equation: $y = mx + b$

ex1) Write the eqn of the line through $(-2,3)$ & $(4,7)$

$$y = \frac{2}{3}x + \frac{13}{3}$$

Point-Slope eqn: $y - y_1 = m(x - x_1)$

2) Write the eqn of the line with slope $1/2$ and point $(4,8)$

$$y - 8 = \frac{1}{2}(x - 4)$$

Parallel Lines

- have the same slope
- never intersect
- distance between them is constant

Perpendicular Lines

- slopes are negative reciprocals (if $m_1 = a/b$, then $m_2 = -b/a$)
- intersect at right angles
- $m_1 \cdot m_2 = -1$

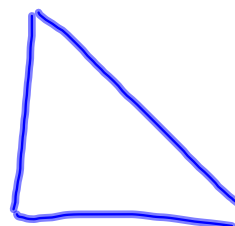
ex3) Write an eqn parallel to $2x - 4y = 7$ and passes through the point $(-1, 4)$

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

4) Write an eqn perpendicular to $5x + 2y = 8$ and passes through the point $(1, -2)$

$$m_{\perp} = \frac{2}{5}$$
$$y + 2 = \frac{2}{5}(x - 1)$$

HW: p 17, # 1-6, 20, 28-32e, 42, 44, 48, 61, 62, 70, 77, 84, 88



Summary of Line Equations:

1. General Form $Ax + By + C = 0$

2. Vertical Line $x = a$

3. Horizontal Line $y = b$

4. Point-Slope Form $y - y_1 = m(x - x_1)$

5. Slope-Int. Form $y = mx + b$

