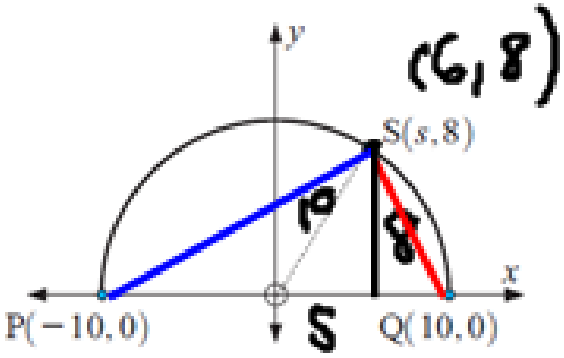
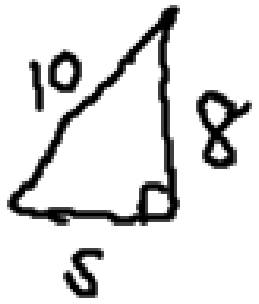
6 S$(s, 8)$ lies on a semi-circle as shown.

a Find s.

b Using this value of s, find the slope of: i [PS] ii [SQ].

c Use b to show that angle PSQ is a right angle.





$m_{PS} = \frac{8-0}{6-(-10)}$

$= \frac{8}{16}$

$= \frac{1}{2}$

$m_{SQ} = \frac{8-0}{6-10}$

$= \frac{8}{-4}$

$= -2$

$s^2 + 8^2 = 10^2$

$s^2 + 64 = 100$

$s^2 = 36$

$s = 6$

c) → perpendicular (meet at a 90° angle)

E – Equations of Straight Lines

Equations of lines can come in many forms. Some of the forms are:

x → independent variable
y → dependent variable
m = slope
c = y intercept

- General Form: $Ax + By = C$
- Gradient-intercept Form: $y = mx + c$

slope-intercept (m ↓ slope, c ↓ y int)

A, B, and C are all integers (no fractions)

Examples:

always y=

(a) Find the gradient of the line: $2x + 5y = 16$

change to slope intercept form

rearrange to y=

$$2x + 5y = 16$$
$$-2x \qquad -2x$$
$$\frac{5y}{5} = \frac{-2x + 16}{5}$$
$$y = \frac{-2}{5}x + \frac{16}{5}$$

→ slope is $\frac{-2}{5}$

(b) Find the equation of the line that has gradient -3 and passes through the point (2, -5).

x y

slope
m

$y = mx + c$

$-5 = -3(2) + c$

Fill in m, x, y and solve for c

$-5 = -6 + c$

$+6 \quad +6$

$1 = c$

$y = -3x + 1$

* always have the final eq'n with x and y as letters

(c) Find the equation of the line that passes through (-2, -3) and (1, 4).

$x_1\ y_1 \quad x_2\ y_2$

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

$$m = \frac{4 - -3}{1 - -2}$$

$$m = \frac{7}{3}$$

$y = mx + c$

$$4 = \frac{7}{3}(1) + c$$

$$4 = \frac{7}{3} + c$$

$$4 - \frac{7}{3} = c$$

$$\frac{12}{3} - \frac{7}{3} = c$$

$$\frac{5}{3} = c$$

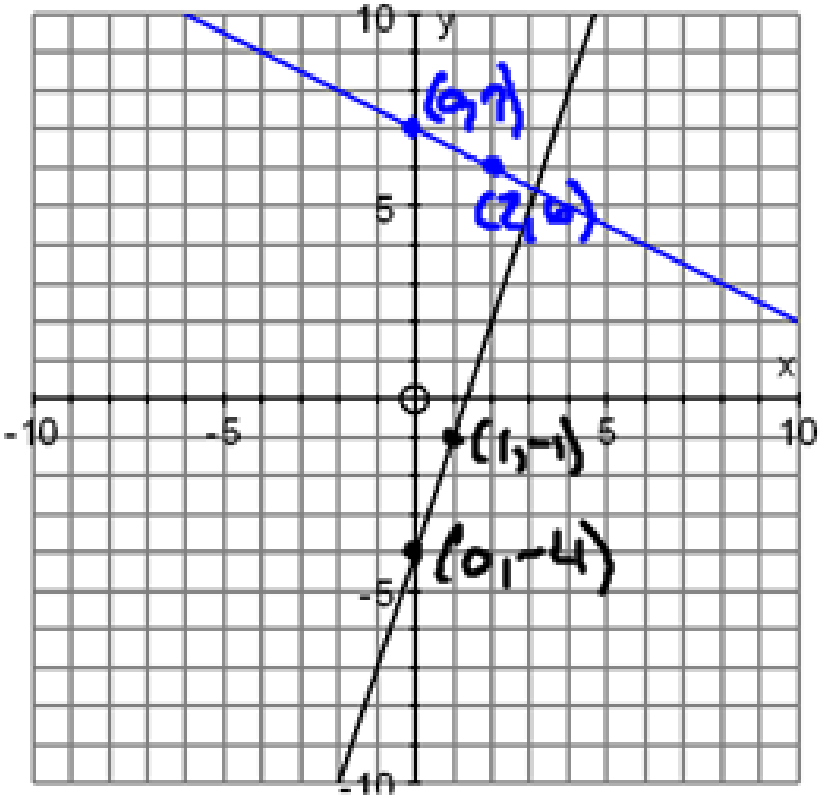
When filling in x and y they have to come from the same point.

$$y = \frac{7}{3}x + \frac{5}{3}$$

Getting the equation from a graph

Step 1- Identify y-intercept

Step 2- Identify gradient



y int -4

$m = \frac{-4-1}{0-1} = \frac{-3}{-1} = 3$

$y = 3x - 4$

$\frac{-1}{2}$ slope y int 7

$y = \frac{-1}{2}x + 7$

More Examples:

(a) Find the equation of the line that passes through (-2, -1) and is parallel to $2x + y = 3$.

x y

put into slope intercept form

$y = -2x + 3$

Slope = -2

$y = mx + c$

$-1 = -2(-2) + c$

$-1 = 4 + c$

$-5 = c$

$y = -2x - 5$

(b) Give the equation of a line that passes through (1,3) and is perpendicular to $x + 8y = -32$.

xy

Slope intercept

$x + 8y = -32$

$-x \quad -x$

$8y = -x - 32$

$\frac{8y}{8} = \frac{-x - 32}{8}$

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

perpendicular slope = 8

$y = mx + c$

$3 = 8(1) + c$

$3 = 8 + c$

$-5 = c$

$y = 8x - 5$

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HW: Section 5.E.1 #1-3