1.1 – Rectangular Coordinates, Lines

<u>**Groups try these**</u>**...**

#1) Plot the points $(2,0),(2,-3),(2,4),(2,1),(2,-1)$.

Describe the collection of all points of the form $(2, y)$ where y is a real number.

#2) Fill in the missing values if $2x - y = 6$

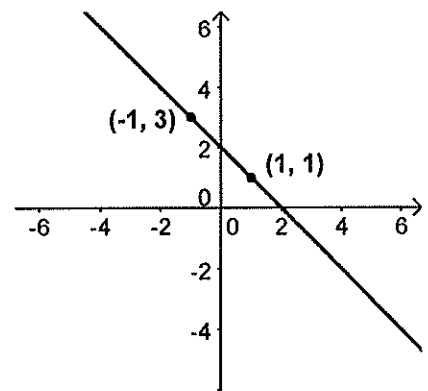| x	0		2	-2	4	-4
y		0				

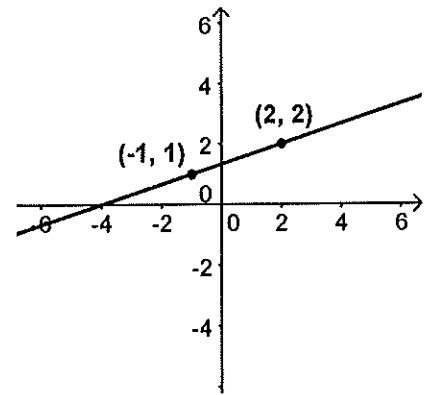#3) Find the x-intercept and the y-intercept and graph the equation: $3x + 2y = 0$

#4) Find the x-intercept and the y-intercept and graph the equation: $y = 5x - 7$

#5) Plot the points and determine the slope, then graph the line: $\left(\sqrt{2},3\right), \left(1,\sqrt{3}\right)$

#6) Find the equation of this line and write it in <u>general form</u>:

#7) Find the equation of this line and write it in <u>point-slope form</u>:

#8) Find the equation of the line (in general form Ax+By=C) that has $slope = -\dfrac{2}{3}$ and passes through $(1, -1)$.

#9) **Profit from selling newspapers:** Each Sunday, a newspaper agency sells x copies of a certain newspaper for $1.00 per copy. The cost to the agency of each newspaper is $0.50. The agency pays a fixed cost for storage, delivery, etc. of $100.00 per Sunday.

Write an equation that relates the profit, P (in dollars) to the number x of copies sold. Graph this equation.

<u>**Terms to Recall:**</u>
Ordered pair, x-coordinate (abscissa, independent variable), y-coordinate (ordinate, dependent variable), origin, quadrant.

<u>Forms of an equation of a line</u>:

<u>Slope-intercept</u>: $y = mx + b$ 　　　　　　　　<u>General/Standard</u>: $Ax + By = C$

<u>Point-slope</u>: $(y - y_1) = m(x - x_1)$
　　　　　　　$where \ (x_1, y_1) \ is \ any \ point \ on \ the \ line$

<u>Slope formula</u>: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ 　　　　　　<u>Vertical line</u>: $x = a$ 　$where \ (a, 0) \ is \ the \ x - int.$

　　　　　　　　　　　　　　　　　<u>Horizontal line</u>: $y = b$ 　$where \ (0, b) \ is \ the \ y - int.$

#10) Find the slope and y-intercept of this line, and graph the line. $2x - 3y = 6$

#11) Find a general form equation for the y-axis.

#12) Find the equation of the line given the following:

$x - intercept = (-4, 0)$ and $y - intercept = (0, 4)$

#13) **Electricity Rates:** Commonwealth Edison Company supplies electricity in the summer months to residential customers for a monthly charge of $9.36 plus 10.494 cents per kilowatt-hour for up to 400 kilowatt-hours.

(a) Write an equation that relates the monthly charge C, in dollars, to the number x of kilowatt-hours used in a month.

(b) Graph this equation.

(c) What is the monthly charge for using 100 kilowatt-hours?

(d) What is the monthly charge for using 300 kilowatt-hours?

(e) Interpret the meaning of the 'slope' of the line in this problem.

1.2 – Parallel and Perpendicular Lines

#1) Determine whether the given pair of lines are parallel, intersecting, or coincident:

$$2x + y = 8$$
$$2x - y = -4$$

#2) Find the point of intersection. Graph the pair of lines:
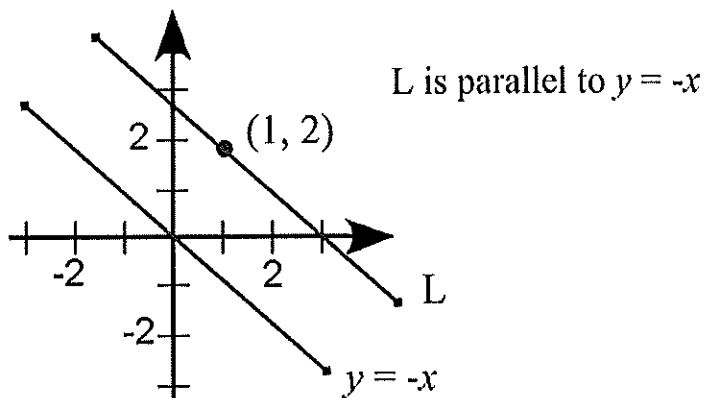
$$4x + 3y = 2$$
$$2x - y = -1$$

#3) Show that the lines are perpendicular:

$$20x - 2y = -7$$
$$x + 10y = 8$$

#4) Find an equation for the line L (write the equation in general form).

L is parallel to $y = -x$

(1, 2)

L

$y = -x$

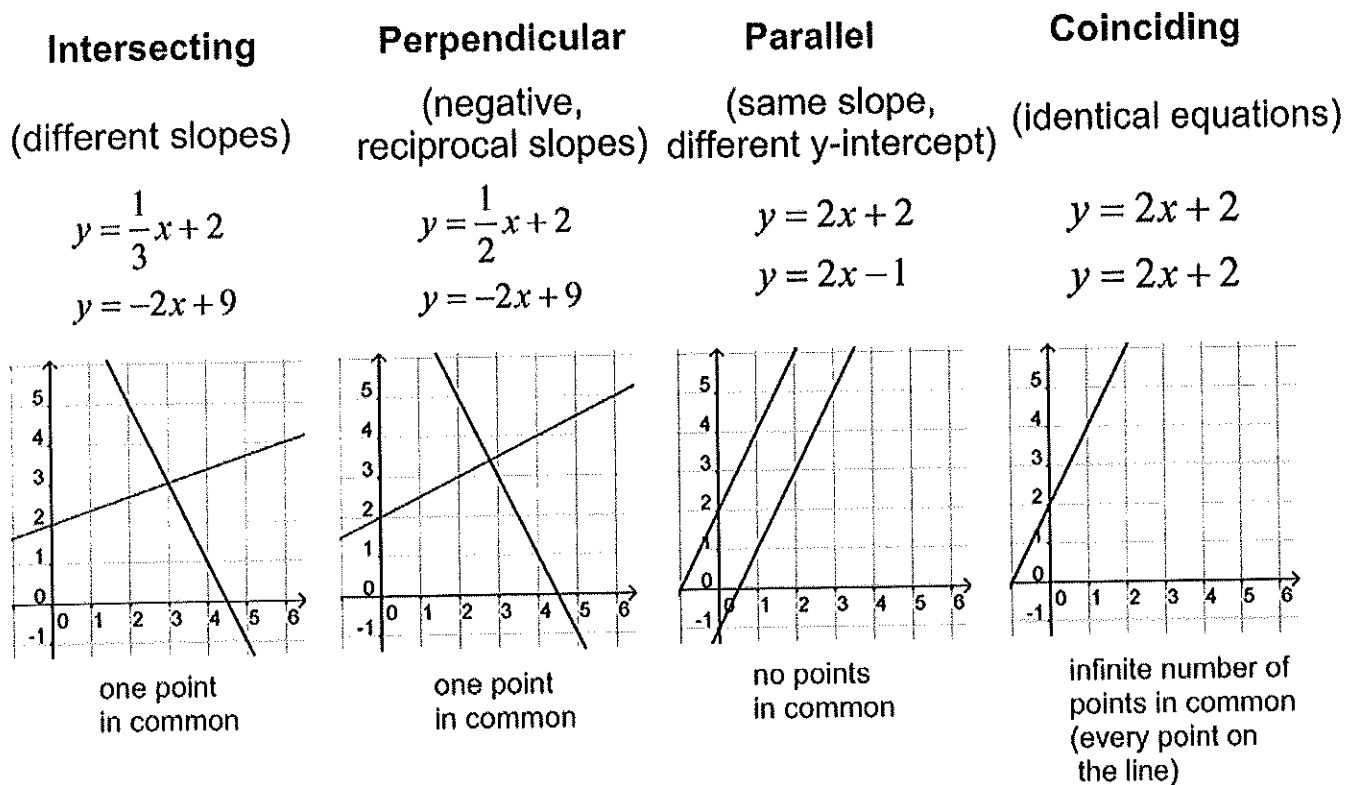#5) Find an equation for the line. (Write the equation in slope-intercept form).

Perpendicular to the line $y = 3x - 15$ passing through $\left(-\frac{2}{3}, \frac{3}{5} \right)$

#6) Find the equation of the line passing through (-2, -5) and
Perpendicular to the line through (-4, 5) and (2, -1).

#7) Find the equation of the vertical line passing through (-2, 5).

#8) Find the equation of the horizontal line passing through (-2, 5).

#9) Find the equation of the line passing through (-2, -5) and
Parallel to the line through (-4, 5) and (2, -1).

Intersecting	**Perpendicular**	**Parallel**	**Coinciding**
(different slopes)	(negative, reciprocal slopes)	(same slope, different y-intercept)	(identical equations)
$y = \frac{1}{3}x + 2$	$y = \frac{1}{2}x + 2$	$y = 2x + 2$	$y = 2x + 2$
$y = -2x + 9$	$y = -2x + 9$	$y = 2x - 1$	$y = 2x + 2$

one point in common	one point in common	no points in common	infinite number of points in common (every point on the line)

Finding an equation of a line:

1) Find the slope you need:
   - Use given slope.
   - Use points to find slope.
   - Use slope of another line to get slope (same or neg. recip.)

2) Build a new equation using the slope and point information:
   - Use point slope form for point 'passes through'.
   - Use any form and 'plug in' x, y from given point to solve for missing constant.

1.3 – Applications

Terms to know:

Cost, C(x): The amount of money it takes to produce x units of something.
Revenue, R(x): The amount of money you make from selling x units of something.
Break-even: When Revenue=Cost, when a business makes enough in revenue to exactly pay its costs (no profit yet).

Supply, S(p): The amount of a commodity sellers are willing to offer at a given price, p.
Demand, D(p): The amount of a commodity buyers are willing to buy at a given price, p.
Market price (or equilibrium): The price at which Supply=Demand, suppliers are willing to offer the same amount of a commodity that buyers are willing to buy.

#1) Profit for Selling Newspapers
Each Sunday a newspaper agency sells x copies of a certain newspaper for $2.00 per copy. The cost to the agency for each newspaper is $1.00. The agency pays a fixed cost for storage, delivery, and so on, of $200 per Sunday. How many newspapers need to be sold for the agency to break even?

#2) Market Price of Sugar
The supply and demand equation for sugar have been estimated to be given by the equations
$$S = 0.7p + 0.4 \qquad D = -0.5p + 1.6$$
Find the market price. What quantity of supply is demanded at this market price? Graph both the supply and demand equations.
Interpret the point of intersection of the two lines.

#3)   Mixture Problem

The manager of Nutt's Nuts regularly sells cashews for $6.50 per pound, pecans for $7.50 per pound, and peanuts for $2.00 per pound. How many pounds of cashews and pecans should be mixed with 40 pounds of peanuts to obtain a mixture of 100 pounds that will sell for $4.89 so that the revenue is unchanged?

#4) Supply and Demand Problem

For a certain commodity the demand equation is given be

$$D = -3p + 20$$

At a price of $1, four units of the commodity are supplied.
If the supply equation is linear and the market price is $4,
find the supply equation.

#5) A coffee manufacturer wants to market a new blend of coffee that will cost $6.00 per pound by mixing $5.00 per pound coffee and $7.50 per pound coffee. What amounts of the $5.00/pound coffee and $7.50/pound coffee should be blended to obtain the desired mixture? HINT: ASSUME TOTAL WEIGHT OF THE DESIRED BLEND IS 100 POUNDS.

#6) Predicting the Cost of a Compact Car

In 1995, the cost of a compact car averaged $8000. In 1998, the cost of a compact car averaged $9500. Assuming that the relationship between time and cost is linear, develop a formula for predicting the average cost of a compact car in the future. What do you predict the average cost of a compact car was be in 2000?