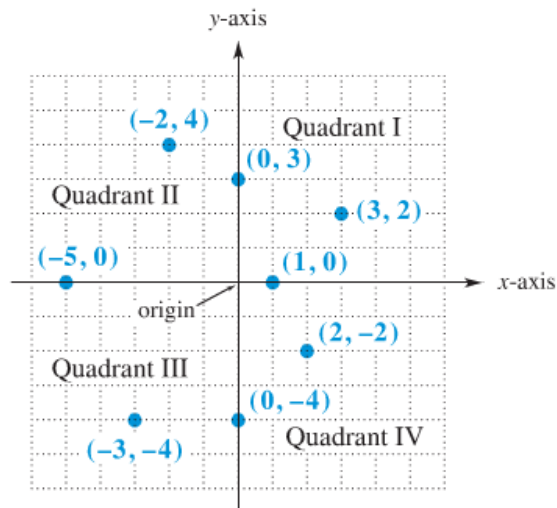


2.1 Graphs

Properties of Cartesian Coordinates:

System consists of a horizontal number line (i.e. the _____) and a vertical number line (i.e. the _____), with ordered pairs (x -coordinate, y -coordinate)

Graph of an Equation with Two Variables is the set of _____ points in the plane whose coordinates (ordered pairs) are _____ of the equation.



*Note: There are often infinitely many solutions to our equations! To see if an ordered pair is a solution, substitute into the given equation to see if it produces a true statement.

Example: Are the following ordered pairs solutions of $y = x^2 + 5x - 3$:

i) $(1, 3)$

ii) $(-2, -17)$

Definition :

i) **x -intercept:** the x -coordinate where the graph intersects the _____

Note: At the x -intercept, the y -coordinate is always _____!

Finding: To find the x -intercept, let _____, and _____

ii) **y -intercept:** the y -coordinate where the graph intersects the _____

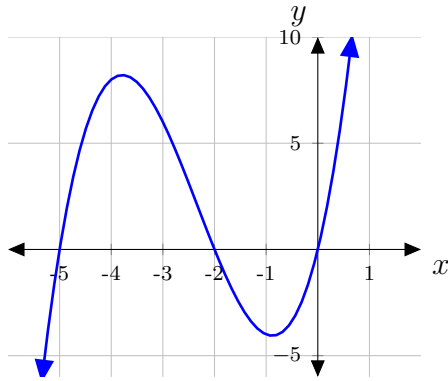
Note: At the y -intercept, the x -coordinate is always _____!

Finding: To find the y -intercept, let _____, and _____

Example: List the x -intercepts and y -intercepts of the following graphs:

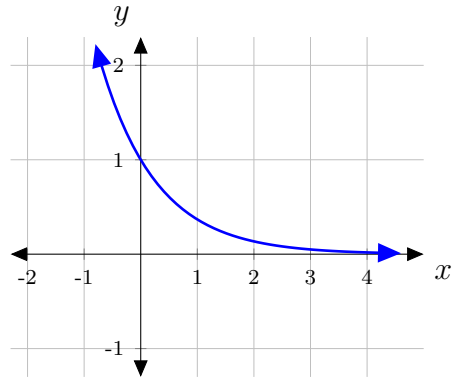
i) x -int: _____

y -int: _____



ii) x -int: _____

y -int: _____

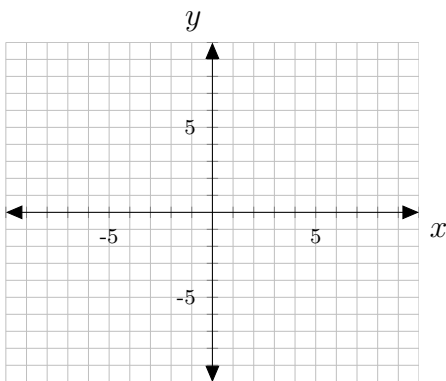


Example: Find the x - and y -intercepts of each graph. Then sketch each graph using AT LEAST THREE points.

i) $2x + y = 5$

x -int: _____

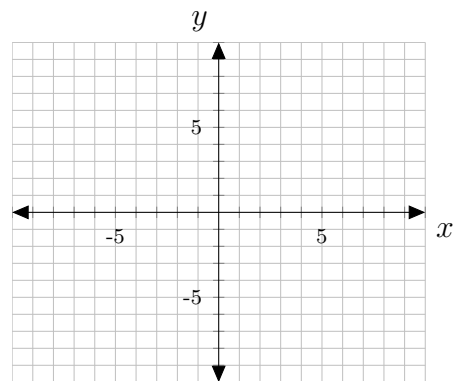
y -int: _____



ii) $y = x^2 - 2x - 8$

x -int: _____

y -int: _____



Example: At various locations around the United States, the National Weather Service continuously records the temperature in graphical form. The results for July 2, 2008, in Salt Lake City, Utah are displayed in the figure below. The horizontal axis represents the "hours after midnight", and the vertical axis represents the temperature at a given time.

- i) What was the temperature at 8 am and 7 pm?
- ii) At what time during the day was the temperature below 80° ?

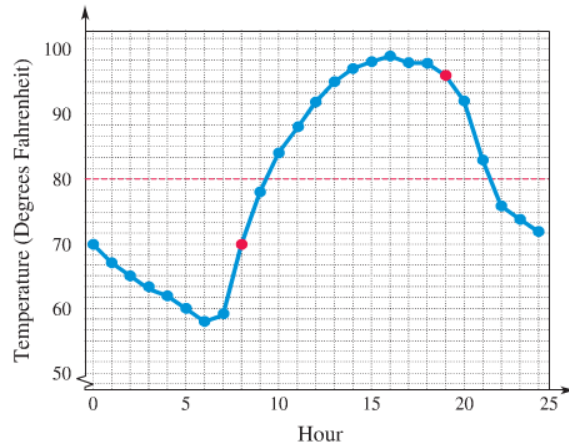
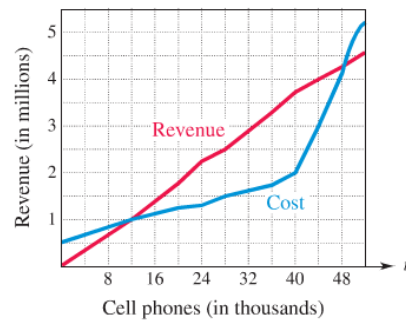


FIGURE 2.7

Example: Monthly revenue and costs for the Webster Cell Phone Company are determined by the number t of phones produced and sold, as shown in the figure below.

- i) How many phones should be produced each month if the company is to make a profit?
- ii) Is it more profitable to make 40,000 or 44,000 phones?



2.1 Problems: 4, 5, 8, 11, 13-16, 19, 20, 22, 23, 29, 39, 47, 49-52, 58, 59, 61

2.2 Equations of Lines and 2.3 Linear Models

Definition [Slope]: Given (x_1, y_1) and (x_2, y_2) : slope = $m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$

- i) **Slope intercept form:** $y = mx + b$, with $m = \text{slope}$, $b = y\text{-intercept}$
- ii) **Point-slope form:** $y - y_1 = m(x - x_1)$, $m = \text{slope}$, $(x_1, y_1) = \text{any point on line}$
- iii) **Parallel Lines:** lines that have the same slope
- iv) **Perpendicular Lines:** lines whose slopes are negative reciprocals
- v) **Vertical Line:** through (a, b) has undefined slope and equation $x = a$.
- vi) **Horizontal Line:** through (a, b) has slope = 0 and equation $y = b$.

Example: Find the slope of the line through the points below:

i) $(-6, 8)$ and $(5, 4)$

ii) $(-3, -5)$ and $(2, -5)$

iii) $(-4, 2)$ and $(-2, -7)$

iv) $(4, -2)$ and $(4, 1)$

Example: Find the slope and y -intercept for each of the following lines:

i) $5x - 3y = 1$

Slope: ____

y -int: ____

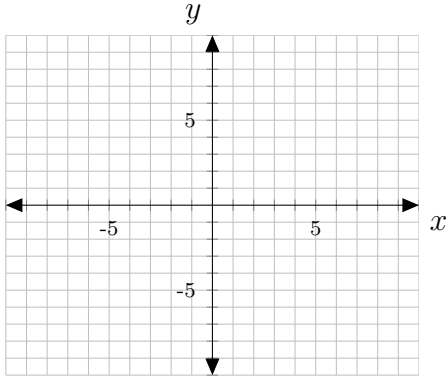
ii) $9x + 6y - 2 = 0$

Slope: ____

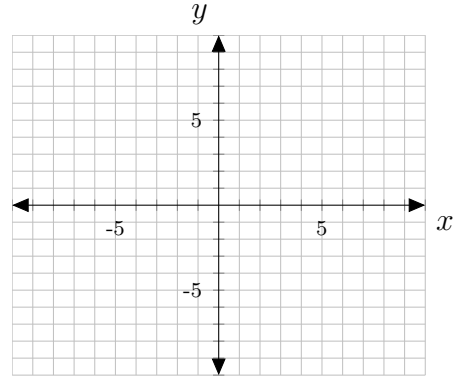
y -int: ____

Example: Sketch each of the functions below and label the intercepts:

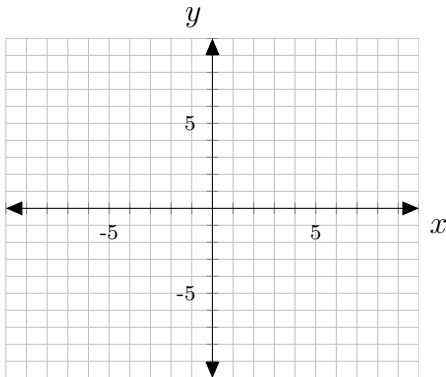
i) $x + 2y = 5$



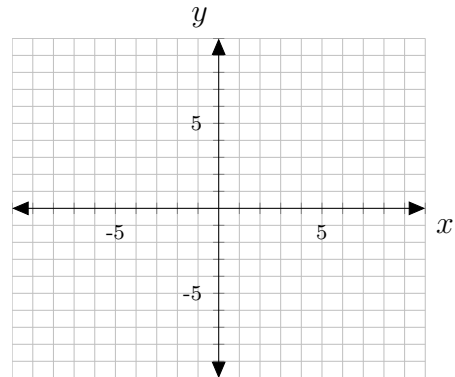
ii) $3x - 4y = 12$



iii) $y + 4 = 0$



iv) $5x - 15 = 0$



Example: Determine whether the given pairs of lines are parallel, perpendicular, or neither.

i) $x - 2y = 6$

$2x + y = 5$

ii) $3x + y = 8$

$x + 3y = 2$

iii) $2x - y = 7$

$2y = 4x - 5$

Example: Find the equation (in Slope intercept form) for each line described below:

i) y -intercept = $\frac{7}{2}$ and slope = $-\frac{5}{2}$

ii) Through $(-4, 1)$ with slope = -3

iii) Horizontal Line through $(4, -7)$

iv) Through $(5, 4)$ and $(-10, -2)$

v) Through $(1, 3)$, parallel to $2x - y = -6$

vi) Through $(-5, 2)$, perpendicular to the line that passes through $(1, 2)$ and $(4, 3)$

Example: According to data from the National Center for Education Statistics, the average cost of tuition and fees in public four year colleges was \$2987 in the fall of 1996 and grew in an approximately linear fashion to \$5685 in the fall of 2006.

i) Find a linear equation for this data, by letting $x = 2$ correspond to the year 1992.

ii) Use this equation to estimate the average cost of tuition and fees in the fall of 2004.

iii) Assuming the equation remains valid beyond fall 2006, estimate when the average cost of tuition and fees will be \$7843.

Example: Charges for Brighton Electric are as follows:

i) Write a linear model for the cost of electricity, stating what slope and y-intercept represent.

	kWh used	Cost
George	258	\$43.38
Mabel	346	\$53.06
Luis	300	\$48

ii) How much would you pay for using 500 kWh?

2.2 Problems: 7, 9, 19, 20, 25, 26, 31, 34, 38, 41, 51, 52, 55, 57, 61, 75, 76, 77, 79

2.3 Problems: 1, 2, 4, 5, 8, 9

2.4 Linear Inequalities

Properties [of solving Linear Inequalities]: Solving linear inequalities is almost exactly the same as solving linear equations EXCEPT:

*If you are having trouble remembering how to graph the solutions, refer to section 1.1 notes.

Example: Solve and graph the solution of each of the following:

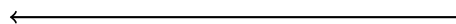
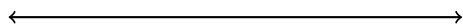
i) $5z - 11 < 14$

ii) $5 - 3k \leq -7$



iii) $\frac{2}{9}(3x + 2) \geq \frac{8}{3}(x - 4)$

iv) $-1 \leq \frac{(5y + 2)}{3} \leq 4$



Example: ABC Incorporated produces x alphabet blocks with a cost of production given by $C = 70x - 500$. If the revenue per unit produced is given by $R = 60x$, then how many blocks must be produced in order for ABC Incorporated to at least break even?

2.4 Problems: 2, 12, 13, 15, 22, 23, 25, 27-30, 31, 32, 35

2.5 Polynomial and Rational Inequalities

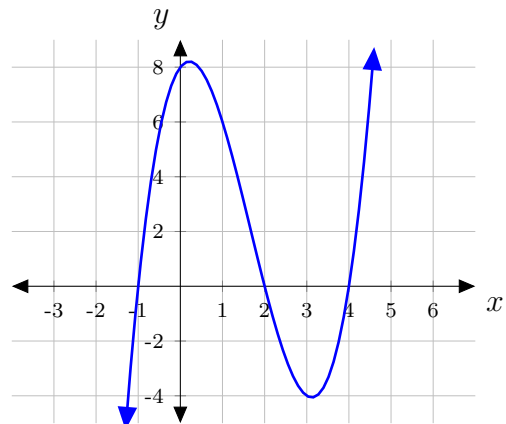
Properties of Polynomial and Rational Inequalities:

Consider $y = x^3 - 5x^2 + 2x + 8$ and its graph

to determine when:

$$x^3 - 5x^2 + 2x + 8 > 0: \underline{\hspace{2cm}}$$

$$x^3 - 5x^2 + 2x + 8 < 0: \underline{\hspace{2cm}}$$



Example: Solve each inequality and state the answer using interval notation:

i) $x^2 - x < 12$

ii) $x^2 - x > 12$

iii) $y^3 - 16y \leq 0$

iv) $6x + 7 < 2x^2$ (graphing calculator)

v) $\frac{5}{x+4} \geq 1$

Example: A wholesale DVD company sells DVDs for \$9 each. The variable cost of producing x thousand DVDs is $3x - 2x^2$ (in thousands of dollars), and the fixed cost is \$176 (in thousands). Find the values of x for which the company will break even or make a profit on the product.

Example: The revenue earned by Texas Instruments Corporation (in billions) can be modeled by the equation $R = 0.145x^2 - 0.27x + 10.0$, where $x = 0$ corresponds to the year 2000. In what years between 2000 and 2006 did revenue exceed \$11 billion?

2.5 Problems: 3, 4, 11, 14, 17, 21, 23, 24, 29, 36, 37, 41, 43