1. Solve the equation:

$$\frac{2}{x} + 6 = \frac{13}{2}$$

$$\begin{aligned} \left(\frac{2}{x} + 6\right) \cdot 2x &= \left(\frac{13}{2}\right) \cdot 2x \\ \frac{2}{x}(2x) + 6(2x) &= 13x \\ 4 + 12x &= 13x \\ 4 &= x \end{aligned}$$

2. If a restaurant bill comes to \$20 (including tax, but not tip) and then you add a 15% tip, how much is the total cost of the meal?

$$\begin{aligned} \text{The tip comes to } (0.15) \cdot (20) &= \$3.00 \\ \text{So altogether, the bill comes to } \$20 + \$3 &= \$23 \end{aligned}$$

3. If $f(x) = 3x^2 + 4$, find $\dfrac{f(2+h) - f(2)}{h}$.

$$\begin{aligned} \frac{f(2+h) - f(2)}{h} &= \frac{\left(3(2+h)^2 + 4\right) - \left(3(2)^2 + 4\right)}{h} \\ &= \frac{3(4 + 4h + h^2) + 4 - 16}{h} \\ &= \frac{12 + 12h + 3h^2 - 12}{h} \\ &= \frac{12h + 3h^2}{h} \\ &= 12 + 3h \end{aligned}$$

4. Suppose a company that makes frisbees has a fixed weekly cost of \$10,000 and makes the frisbees at a cost of \$0.50 each. If it sells the frisbees for \$4.50 each, how many must it sell to break even?

$$\begin{aligned} C(x) &= 10,000 + 0.5x \\ R(x) &= 4.5x \\ P(x) &= R(x) - C(x) = 4.5x - (10,000 + 0.5x) = 4x - 10,000 \end{aligned}$$

$$\begin{aligned} \text{To break even} &: \\ 4x - 10,000 &= 0 \\ 4x &= 10,000 \\ x &= 2,500 \end{aligned}$$

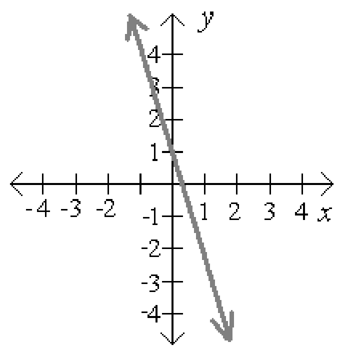
It must sell 2,500 frisbees to break even.

5. Write the equation of the line that passes through the points $(1,3)$ and $(2,7)$.

$$\begin{aligned}\text{The slope is } m &= \frac{y_2-y_1}{x_2-x_1}=\frac{7-3}{2-1}=\frac{4}{1}=4.\\ \text{Using the point } (1,3)\text{, we have } &: \\ 3 &= (4)(1)+b \\ 3 &= 4+b \\ b &= -1\end{aligned}$$

The line is $y = 4x - 1$.

6. Write a reasonable equation for the line sketched below:



$y = -3x + 1$

7. Solve the system of equations:

$$\begin{cases} 4x + y = 5 \\ 8x - 3y = 0 \end{cases}$$

$$\begin{cases} 4x + y = 5 \\ 8x - 3y = 0 \end{cases} \begin{array}{c} \stackrel{*3}{\Longrightarrow} \\ \Longrightarrow \end{array} \begin{array}{r} 12x + 3y = 15 \\ 8x - 3y = 0 \\ \hline \end{array}$$

$$20x + 0 = 15$$
$$20x = 15$$
$$x = \frac{15}{20} = \frac{3}{4}$$

$$\begin{aligned} 4\left(\frac{3}{4}\right) + y &= 5 \\ 3 + y &= 5 \\ y &= 2 \end{aligned}$$

The solution is $\left(\frac{3}{4}, 2\right)$.

8. Robin wants to buy soda and chips for charity. The soda costs \$1 per can and the chips cost \$2 per bag. Robin wants to spend exactly \$20 and wants to buy exactly 15 items. Set up, **but do not solve**, a system of equations that models this situation. Remember that you must introduce your variables properly.

Let $x =$ the number of sodas Robin will buy and let $y =$ the number of bags of chips.

$$\begin{aligned} x+y &= 15 \\ x+2y &= 20 \end{aligned}$$

9. Solve the equation:

$$x^2 - 6x + 8 = 0$$
$$(x-4)(x-2) = 0$$

$$\begin{aligned} x-4 &= 0 \text{ OR } x-2=0 \\ x &= 4 \text{ OR } x=2 \end{aligned}$$

10. Solve the equation:

$$2x^2 - 2x - 1 = 0$$

$$x = \frac{-(-2) + \sqrt{(-2)^2 - 4(2)(-1)}}{2(2)} \text{ OR } x = \frac{-(-2) - \sqrt{(-2)^2 - 4(2)(-1)}}{2(2)}$$
$$x = \frac{2+\sqrt{12}}{4} \text{ OR } x = \frac{2-\sqrt{12}}{4}$$

11. Find the vertex of the graph:

$$y = 3x^2 - 3x + 1$$

$$\begin{aligned} x &= \frac{-(-3)}{2(3)} = \frac{1}{2} \\ y &= 3\left(\frac{1}{2}\right)^2 - 3\left(\frac{1}{2}\right) + 1 = \frac{3}{4} - \frac{3}{2} + 1 = \frac{1}{4} \end{aligned}$$

$$\text{The vertex is } \left(\frac{1}{2}, \frac{1}{4}\right).$$

12. Suppose the monthly profit function for a particular company $P(x) = 4 + 6x - x^2$, where x is how many thousands of units are produced and $P(x)$ is how many thousands of dollars in profit is earned. What is the maximum monthly profit this company can make?

Since the profit function is a parabola opening downward, the maximum is the $y-$ value of the vertex.

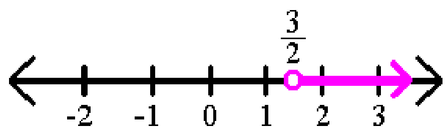
$$\begin{aligned} x &= \frac{-6}{2(-1)} = 3 \\ y &= 4 + 6(3) - (3)^2 = 13 \end{aligned}$$

The maximum monthly profit is \$13,000.

13. Solve the inequality and graph your solution on a number line:

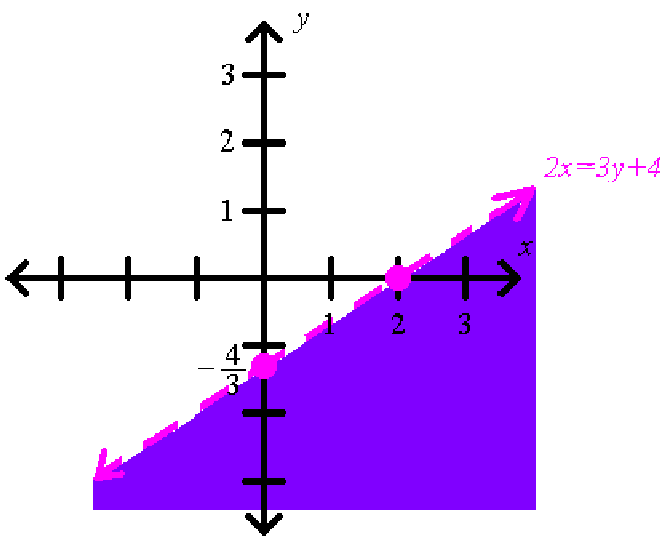
$$3x - 2 > x + 1$$

$$\begin{aligned} 2x &> 3 \\ x &> \frac{3}{2} \end{aligned}$$



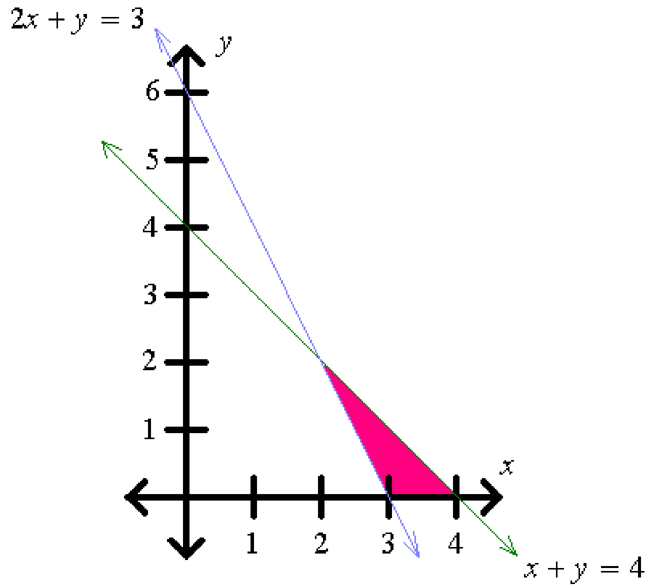
14. Graph the inequality:

$$2x > 3y + 4$$



15. Graph the solution to the system of inequalities:

$$\begin{cases} x + y \leq 4 \\ 2x + y \geq 3 \\ x \geq 0, y \geq 0 \end{cases}$$



16. Find all points where the line $y = 2x + 3$ and the parabola $y = x^2$ intersect.

$$\begin{aligned} x^2 &= 2x + 3 \\ x^2 - 2x - 3 &= 0 \\ (x - 3)(x + 1) &= 0 \end{aligned}$$

$$\begin{aligned} x - 3 &= 0 \text{ OR } x + 1 = 0 \\ x &= 3 \text{ OR } x = -1 \end{aligned}$$

$$\begin{aligned} \text{When } x &= 3, y = 9. \\ \text{When } x &= -1, y = 1. \end{aligned}$$

The points of intersection are $(3, 9)$ and $(-1, 1)$.