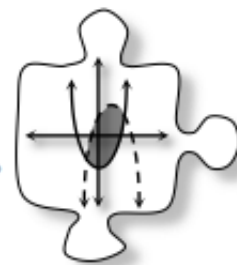


4.2.4 What can I learn from a graph?

Using Graphs to Find Solutions



You have seen that you can find solutions to problems, equations, inequalities and systems using graphs. In this lesson, you will apply this knowledge to a math competition challenge.

4-98. MATH TEAM CHALLENGE

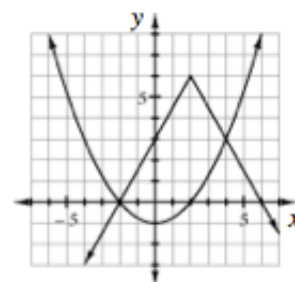
At the annual two-day Math Challenge, teams from various high schools get together for a sometimes not-too-friendly math competition. Your school's biggest rival, Silicon Mountain High School, has won the competition the last five years and is already bragging that they will take first place again. However, your team has worked exceptionally hard this year to understand the Algebra 2 curriculum and its challenging concepts. Everyone on your team feels confident that they can beat Silicon Mountain High.



At the end of the first day of competition, scores for each school are posted and WOW! Your team and Silicon Mountain's team are tied for first place! Before the teams leave for the day, they are handed a copy of the final problem in the competition (shown below). At first your team is excited, but when your team reads the “Final Challenge,” you all realize that everyone has a lot of work to do before tomorrow's event.

Final Challenge

The three math judges will ask your team five questions that can be answered by looking at the graph of the functions at right. Your score for each answer will depend on its accuracy and completeness.



Your Task: Obtain a [Lesson 4.2.4 Resource Page](#) from your teacher, which contains a copy of the graph in the “Final Challenge.” With your team, discuss the graph and make a list of questions the judges might ask about it. For each question, form a complete response so that your team is prepared for the “Final Challenge.”

Discussion Points

What can a graph tell us about equations? About inequalities?

Can we use the graph to get information about equations and inequalities in one variable and in two variables?



METHODS AND MEANINGS

MATH NOTES

Solutions to One-Variable and Two-Variable Equations

When an equation has one variable, solutions are single numbers. When an equation contains two variables, solutions are ordered pairs.

For example, the solutions for the system of equations shown below are the ordered pairs of numbers (4, 44) and (-1, -11) because these are the (x, y) pairs that make both equations true. They are also the points at which the graphs of the two equations intersect.

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

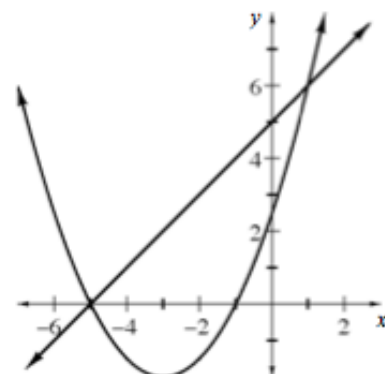
$$y = 2x^2 + 5x - 8$$

The solutions for the equation $2x^2 + 5x - 8 = x^2 + 8x - 4$ are the numbers 4 and -1, because they are the two x -values that make the equation true.



4-99. Consider the graph at right as you answer the following questions. [Help \(Html5\)](#) ⇔ [Help \(Java\)](#)

- Find the equation of the parabola.
- Find the equation of the line.
- Use your graph to solve $x + 5 = \frac{1}{2}(x + 3)^2 - 2$.
- Use your graph to solve the system:

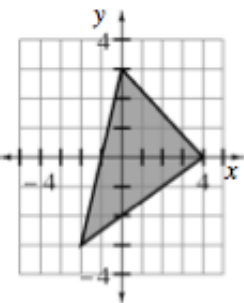


$$y = \frac{1}{2}(x+3)^2 - 2$$

$$y = x + 5$$

- e. Use your graph to solve the inequality $x + 5 < \frac{1}{2}(x+3)^2 - 2$.
- f. Use your graph to solve $\frac{1}{2}(x+3)^2 - 2 = 0$.
- g. Use your graph to solve $x + 5 = 4$.
- h. How could you change the equation of the parabola so that the parabola and the line do not intersect? Is there more than one way?

4-100. Write the three inequalities that form the triangle shown at right. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)



4-101. Solve each of the following inequalities. Represent the solutions algebraically and on a number line. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

a. $2|3x - 5| \geq 4$

b. $\frac{1}{3}(3x - 6)^3 + 4 < 13$

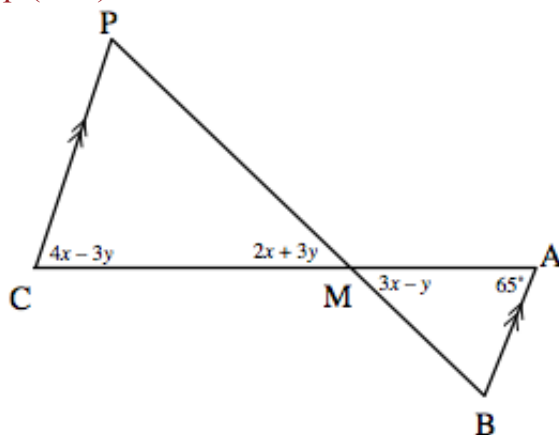
4-102. On separate pairs of axes, sketch the graph of each equation or inequality below. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

a. $y + 5 = (x - 2)^2$

b. $y \leq (x + 3)^3$

c. $y = 4 + \frac{1}{x-3}$

4-103. Find the measure of $\angle CPM$ in the diagram below. List any sub-problems that were necessary to solve this problem. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)



4-104. Graph the solutions to each of the following inequalities on a different set of axes. Label each graph with the inequality as given and with its $y =$ form. Choose a test point and show that it gives the same result in both forms of your inequality. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

a. $3x - 3 < y$

b. $3 > y$

c. $3x - 2y \leq 6$

d. $x^2 - y \leq 9$

4-105. Solve for w in each equation below. [Help \(Html5\)](#) \Leftrightarrow [Help \(Java\)](#)

a. $w^2 + 4w = 0$

b. $5w^2 - 2w = 0$

c. $w^2 = 6w$