LESSON 4.4

Graphs Through Points

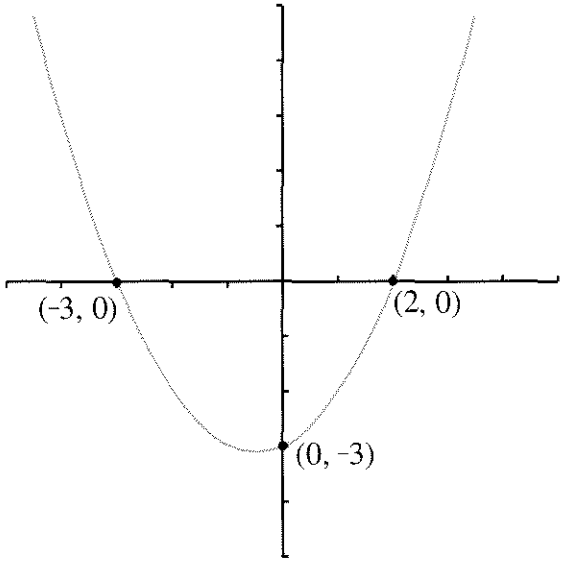
You will need:

graph paper

graphing calculator (optional)

INTERCEPTS

Definitions: The *y-intercept* of a graph is the point where the graph crosses the y-axis. The *x-intercept* of a graph is the point where the graph crosses the x-axis.



Example: The curve in the figure above has y-intercept (0, -3), and x-intercepts (-3, 0) and (2, 0).

For problems 1-5:

a. Guess the coordinates of the x- and y-intercepts (if you think they exist).

b. *On graph paper* draw the graph described.

c. Check the correctness of your guess.

1. A line is parallel to the y-axis and passes through the point (2, -3).

2. A line passes through the origin and the point (2, -3).

3. The sum of every (x, y) pair on the line is 8.

4. The line passes through the points (2, -3) and (3, -2).

5. To get the y-coordinate, square the x-coordinate and add 1.

POINTS ON AND OFF GRAPHS

6. Bea thinks that $8 - 2x$ means *multiply x by 2 and subtract the result from 8.* Lea thinks it means *subtract 2 from 8 and multiply the result by x.* Who is right? Explain.

7. Which of these points do you think will lie on the graph of $y = 8 - 2x$? Explain.

a. (2, 4) b. (2, -4)

c. (0.5, 6) d. (0.5, -6)

e. (-1, -10) f. (-1, 10)

For the remaining problems in this lesson (8-23), use a graphing calculator if you have one. Otherwise, use graph paper.

8. a. Graph $y = 8 - 2x$.

b. Use your graph to check your answers to problem (a).

c. Write both coordinates of the x-intercept of $y = 8 - 2x$.

d. Write both coordinates of the y-intercept of $y = 8 - 2x$.

Definition: If two graphs share a point, they are said to *intersect* at that point.

9. a. On the same coordinate system, graph $y = 2x - 8$.

b. Do your two graphs intersect at any point? If so, where?

Follow these instructions for problems 10 through 12 below.

a. Make tables of values for the two functions given. Then graph them on the same pair of axes. Label at least three points on each graph.
b. Find and label a point that is not on either graph.
c. Find and label a point that is on both graphs (if there is one).
d. Find and label a point that is in the region between the two graphs.
e. Find and label a point that is neither on nor between the graphs.

10. $y = 2x$ and $y = 0.5x$

11. $y = x$ and $y = x + 2$

12. $y = x^2$ and $y = x^2 - 3$

13. For problems 10-12, find an equation whose graph is entirely contained between the two given graphs.

FIND AN EQUATION

In problems 14-17, find the equation of any graph that satisfies the characteristics given.

14. A second-degree function whose graph passes through the point (0, 0)

15. A second-degree function whose graph passes through the point (0, 1)

16. A third-degree function whose graph passes through the point (0, -1)

17. A first-degree function whose graph passes through the point (-1, -1)

18. a. Write any equation whose graph contains the point (1, 2).
b. Write any other equation whose graph passes through the point (1, 2).
c. Graph the two equations. Where do they intersect?

19. **Report** Write a report explaining the answers to these questions. Use examples in your explanations.
a. Given an equation, how can you figure out which points lie on its graph?
b. Given a point and an equation, how can you tell whether or not the point lies on the graph of the equation?

GRAPHS THROUGH THE ORIGIN

20. Which of the following equations have graphs that go through the origin? How could one tell without actually graphing them?
a. $y = 2x - 6$ b. $y = x^2 - x$
c. $y = -x^3 - 4$

21. Give three equations (one each of first, second, and third degree) that satisfy each of these two given conditions.
a. The graph will pass through the origin.
b. The graph will not pass through the origin.

22. Write the equation of a graph that lies in quadrants I and III *only* and
a. passes through the origin;
b. does not pass through the origin.

23. **Summary** Explain how you can tell from an equation whether or not its graph goes through the origin. Give some examples.