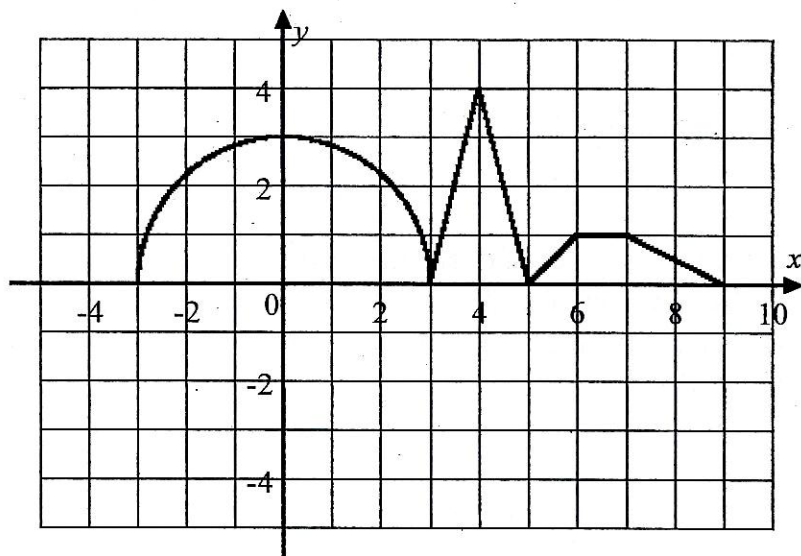


Analyzing Piecewise Functions

Use the graph of $y = f(x)$ and the table of values to answer the questions.



x	$f(x)$
-3	0
0	3
3	0
4	4
5	0
6	1
7	1
9	0

- Classify each of the geometric figures formed between the graph of $f(x)$ and the x -axis.
- What is the total area enclosed by the graph of $f(x)$ and the x -axis?
- Give the equation for each line of symmetry, if one exists, on the following intervals of the graph of $f(x)$.
 $[-3, 3]$ _____ $[3, 5]$ _____ $[5, 9]$ _____ $[-3, 9]$ _____
- For each of the intervals in question 3, how do the lines of symmetry divide the area between the graph of $f(x)$ and the x -axis?
- A vertical line $x = k$ divides the area enclosed between the graph of $f(x)$ and the x -axis into two equal parts. Which geometric figure does this line intersect?

6. If $g(x) = -f(x)$, determine the total area between the graph of $g(x)$ and the x -axis.
7. Classify each of the geometric figures formed between the graphs of $f(x)$ and $g(x)$.
8. What is the area enclosed by the graphs of $f(x)$ and $g(x)$?
9. If $h(x) = 2f(x)$, what is the total area between the graph of $h(x)$ and the x -axis?
(Hint: The figure between $x = -3$ and $x = 3$ is now half of an ellipse with a semi-major axis of $a = 6$ and a semi-minor axis $b = 3$. The area of an ellipse is calculated by the formula $A = \pi ab$, where a and b are the semi-major and semi-minor axes lengths.)
10. If $r(x) = 4f(x)$, what is the total area between the graph of $r(x)$ and the x -axis?
11. Compare the area between the graph of $f(x)$ and the x -axis to the area between the graph of $p(x)$ and the x -axis, where $p(x) = af(x)$, $a > 0$.
12. What is the total area bounded by the graph of $f(x)$, and the lines $y = -1$, $x = -3$, and $x = 9$?
13. If $q(x) = f(x) + 1$, what is the total area bounded by $q(x)$, the x -axis, $x = -3$, and $x = 9$?

14. On what intervals is $f(x)$ decreasing?

15. On what intervals is $f(x)$ increasing?

16. What is the absolute maximum value of $f(x)$?

17. What is the x -coordinate(s) where the absolute minimum value of $f(x)$ occurs?

18. If $g(x) = 2f(x)$, what is the absolute maximum value?

19. Write the equation for $f(x)$ using five equations.

(Hint: Write an equation involving absolute value for the portion of the function between $x = 3$ and $x = 5$.)

$f(x) = \left\{ \begin{array}{l} \text{_____} \\ \text{_____} \\ \text{_____} \\ \text{_____} \\ \text{_____} \end{array} \right.$

20. What is x when $f(x) = \frac{1}{2}$? Justify algebraically.

21. Determine the slope at each of the following points on the graph of $f(x)$. If the point is on the semicircle, the slope will be the same as the slope of the tangent line to the semicircle at that point.

(3.5, _____); slope = _____

(4.5, _____); slope = _____

(6.213, _____); slope = _____

$\left(7\frac{4}{5}, \text{_____}\right)$; slope = _____

(-3, _____); slope = _____

(0, _____); slope = _____