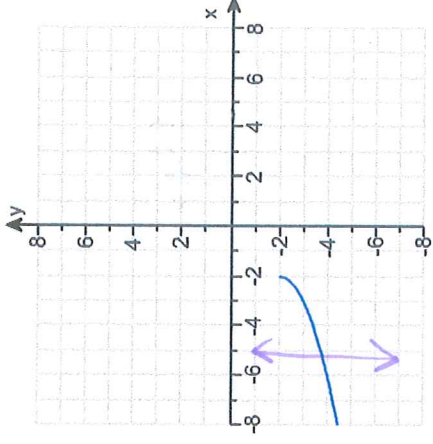


Precalculus
 Practice Test # 1.
 M. Robertson
 Solutions

1. Use the vertical line test on the graph given to the right to determine whether y is a function of x.

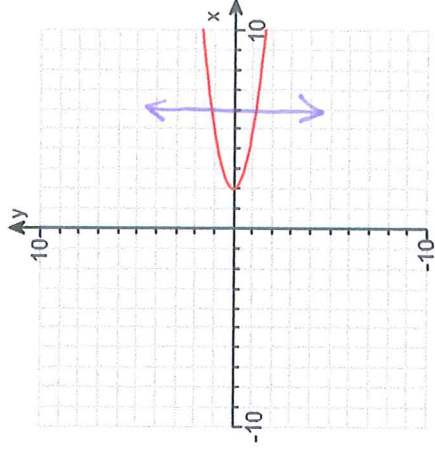


passes vertical line test

Is y a function of x?

- No
- Yes

2. Determine if the relation is a function.



fails vertical line test

Is the relation a function?

- Yes
- No

3. Determine whether the relation is a function.

$c = \{(10, 4), (-9, -4), (2, -1), (4, -8)\}$

Is the relation a function?

- Yes
- No

4. Determine whether the relation is a function.

$$t = \{(8, 10), (17, -2), (38, 10), (8, 9), (47, 9)\}$$

Is the relation a function?

- No
 Yes

5. Determine the domain and range of the following relation.

$$x + 10 = |y|$$

$$x + 10 = |y|$$

The domain of the relation is $[-10, \infty)$.
 (Type your answer in interval notation.)

The range of the relation is $(-\infty, \infty)$.
 (Type your answer in interval notation.)

6. Let $f(x) = -8x^2 + 9x + 7$. Find $f(x+h) - f(x)$.

$$f(x+h) - f(x) = -16xh - 8h^2 + 9h$$

(Simplify your answer.)

$$\begin{aligned} f(x+h) &= -8(x+h)^2 + 9(x+h) + 7 \\ &= -8(x^2 + 2xh + h^2) + 9x + 9h + 7 \\ &= -8x^2 - 16xh - 8h^2 - 9x + 9h + 7 \end{aligned}$$

$$\begin{aligned} f(x+h) - f(x) &= -8x^2 - 16xh - 8h^2 - 9x + 9h + 7 - (-8x^2 + 9x + 7) \\ &= -8x^2 - 16xh - 8h^2 - 9x + 9h + 7 + 8x^2 - 9x - 7 \end{aligned}$$

7. If a new car is valued at \$17,300 and 7 years later it is valued at \$4000, then what is the average rate of change of its value during those 7 years?

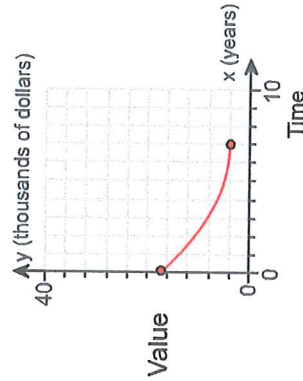
The average rate of change is $-\$1,900$ dollars per year.

$$\frac{(2019, \$17,300) - (2026, 4000)}{7} = \frac{4000 - 17,300}{7} = -\frac{13,300}{7} = -1900$$

8. Find the difference quotient $\frac{f(x+h) - f(x)}{h}$ for the function and simplify it.

$$f(x) = 7x^2 + 10x$$

The difference quotient is $\frac{14x + 7h + 10}{h}$.
 (Simplify your answer. Do not factor.)



$$\begin{aligned} f(x+h) &= 7(x+h)^2 + 10(x+h) \\ &= 7(x^2 + 2xh + h^2) + 10x + 10h \\ &= 7x^2 + 14xh + 7h^2 + 10x + 10h \end{aligned}$$

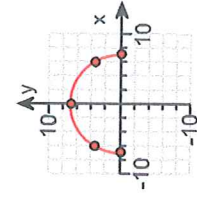
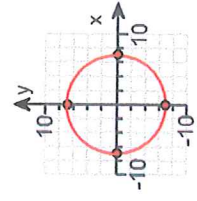
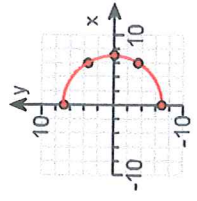
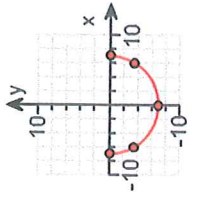
$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{7x^2 + 14xh + 7h^2 + 10x + 10h - (7x^2 + 10x)}{h} \\ &= \frac{14xh + 7h^2 + 10h}{h} = 14x + 7h + 10 \end{aligned}$$

11. Graph the equation. Determine the domain and range, and whether y is a function of x.

$y = -\sqrt{49 - x^2}$
bottom half of a circle

Choose the correct graph.

- A.
- B.
- C.
- D.



What is the domain?

$[-7, 7]$ (Type your answer in interval notation.)

What is the range?

$[-7, 0]$ (Type your answer in interval notation.)

Is y a function of x?

- No
- Yes

12. Graph the relation. Determine the domain and range, and whether the relation is a function.

$x = |y + 4|$

The domain is $[0, \infty)$
(Type your answer in interval notation.)

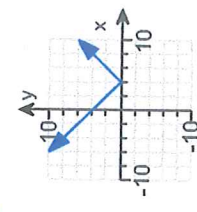
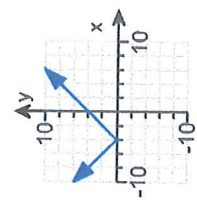
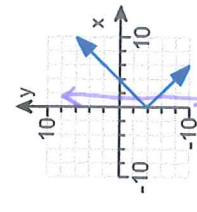
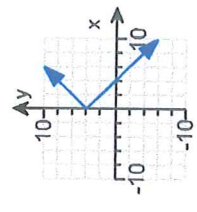
The range is $(-\infty, \infty)$
(Type your answer in interval notation.)

Is the relation a function?

- Yes
- No

Choose the correct graph of the equation.

- A.
- B.
- C.
- D.



13. Graph the function. Determine the domain and range of the graph.

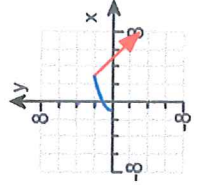
$$f(x) = \begin{cases} \sqrt{x+1} & \text{for } -1 \leq x \leq 3 \\ 5-x & \text{for } x > 3 \end{cases}$$

The domain is $[-1, \infty)$.
 (Type your answer in interval notation.)

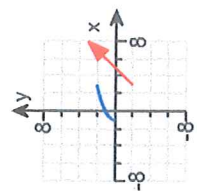
The range is $(-\infty, 2]$.
 (Type your answer in interval notation.)

Choose the correct graph of the function.

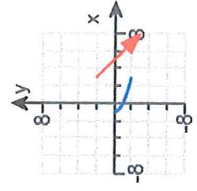
A.



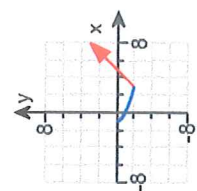
B.



C.



D.

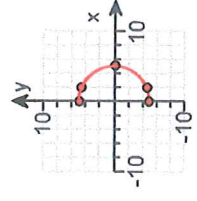


14. Sketch the graph and state the domain and range. Identify any intervals on which $f(x)$ is increasing, decreasing, or constant.

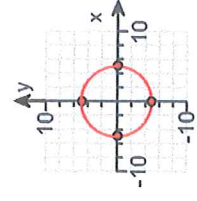
$$f(x) = -\sqrt{25 - x^2}$$

Choose the correct graph.

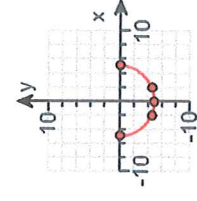
A.



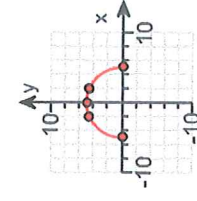
B.



C.



D.



What is the domain?

$[-5, 5]$

(Type your answer in interval notation.)

What is the range?

$[-5, 0]$

(Type your answer in interval notation.)

The function is increasing over what interval?

$(0, 5)$

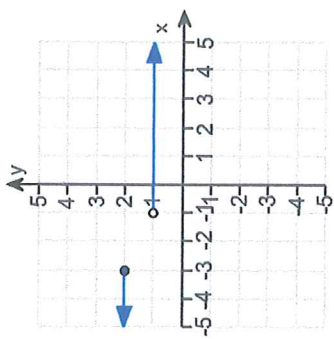
(Type your answer in interval notation.)

The function is decreasing over what interval?

$(-5, 0)$

(Type your answer in interval notation.)

15. Write a piecewise function for the given graph.



What is the rule?

A.

$$f(x) = \begin{cases} 2 & \text{if } x \leq -1 \\ 1 & \text{if } x > -1 \end{cases}$$

B.

$$f(x) = \begin{cases} 2 & \text{if } x \leq -1 \\ 1 & \text{if } x > -3 \end{cases}$$

C.

$$f(x) = \begin{cases} 2 & \text{if } x \leq -3 \\ 1 & \text{if } x > -1 \end{cases}$$

16. Sketch the graphs of the following pair of functions on the same coordinate plane.

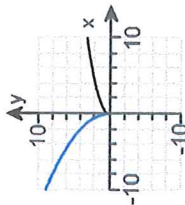
$$y = \sqrt{x}, y = 8\sqrt{x}$$

The points (0, 0), (1, 1), and (4, 2) of $y = \sqrt{x}$ translate to the points
 (Type an ordered pair. Use a comma to separate answers as needed.)

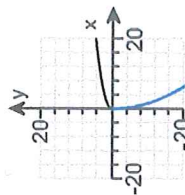
(0,0), (1,8), (4,16)

Choose the correct graph that shows the pair of functions on the same coordinate plane.

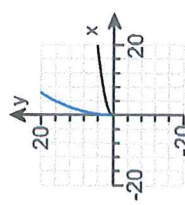
A.



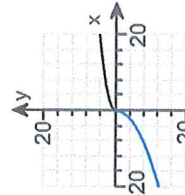
B.



C.



D.



17. Sketch the graph of the first function. Then, on the same coordinate plane, use a transformation to sketch the second graph.

$$y = \sqrt{9 - x^2}, y = -\sqrt{9 - x^2}$$

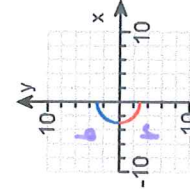
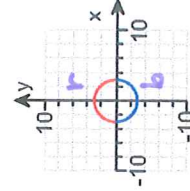
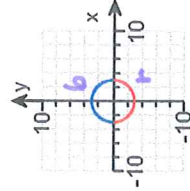
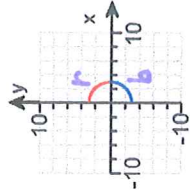
Which graph shows $y = \sqrt{9 - x^2}$ in red and $y = -\sqrt{9 - x^2}$ in blue?

A.

B.

C.

D.



18. Choose the graph that matches the function $y = (x + 2)^2 + 5$.

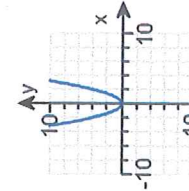
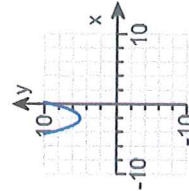
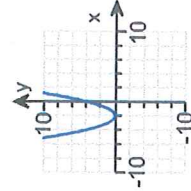
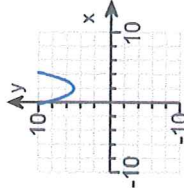
Choose the correct graph.

A.

B.

C.

D.



19. Write the function whose graph is the graph of $y = |x|$, but is translated 1 unit to the left and 3 units upward.

$$y = |x + 1| + 3$$

20. Use transformations to graph the following function, and state the domain and range.

$$y = (x - 6)^2 - 5$$

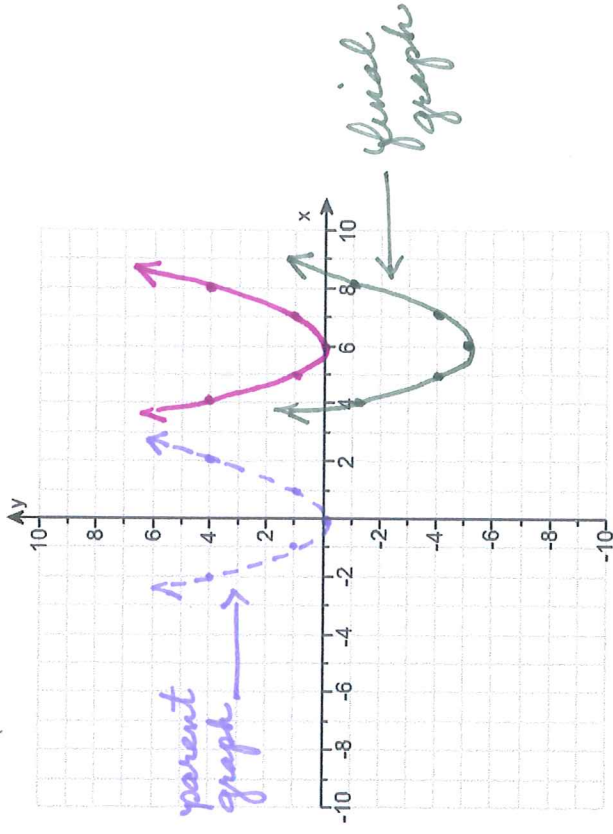
Use the graphing tool to graph the function.

What is the domain?

$(-\infty, \infty)$
(Type your answer in interval notation.)

What is the range?

$[-5, \infty)$
(Type your answer in interval notation.)



21. Use transformations to graph the function. State the domain and range.

$$y = -\sqrt{x + 1} - 4$$

What is the domain?

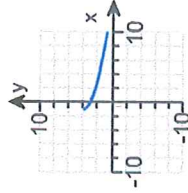
$[-1, \infty)$
(Type your answer in interval notation.)

What is the range?

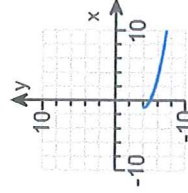
$(-\infty, -4]$
(Type your answer in interval notation.)

Choose the correct graph.

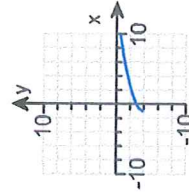
A.



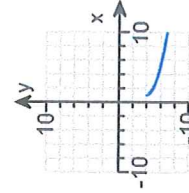
B.



C.



D.



22. Determine whether the graph of the function is symmetric about the y-axis or the origin. Indicate whether the function is even, odd, or neither.

$$f(x) = 5x^4 - 5x^3$$

Is the graph of the function symmetric about the y-axis or the origin?

- A. neither
 B. origin
 C. y-axis

Is the function even, odd, or neither?

- A. neither
 B. even
 C. odd

$$\begin{aligned}
 f(-x) &= 5(-x)^4 - 5(-x)^3 \\
 &= 5x^4 + 5x^3 \\
 -f(x) &= -5x^4 + 5x^3
 \end{aligned}$$

$f(x) \neq f(-x)$ not even
 $f(-x) \neq -f(x)$ not odd
 \therefore neither

23. Determine algebraically whether the function is even, odd, or neither. Discuss the symmetry of the function.

$$f(x) = 4x^7 + 2x$$

Determine algebraically whether the function is even, odd, or neither. Choose the correct answer below.

- even
 neither
 odd

$$\begin{aligned}
 f(-x) &= 4(-x)^7 + 2(-x) \\
 &= -4x^7 - 2x \\
 -f(x) &= -4x^7 - 2x \\
 f(-x) &= -f(x)
 \end{aligned}$$

Determine the symmetry of the function. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is not symmetric about an axis, but it is symmetric about the vertical line

(Type an equation.)

- B. The function is symmetric about the origin.
 C. The function is symmetric about the y-axis.
 D. The function is symmetric about the x-axis.
 E. The function contains no symmetry.

24. Let $f(x) = -4x + 3$ and $g(x) = x^2 + 3$.

Find $(f + g)(x)$.

$$(f + g)(x) = x^2 - 4x + 6$$

(Simplify your answer.)

25. Consider the given functions, $f(x)$ and $g(x)$. Find the equation defining $(g/f)(x)$ and state its domain.

$$f(x) = \sqrt{x}, g(x) = x - 12$$

$$\frac{g}{f} = \frac{x-12}{\sqrt{x}}$$

$$\frac{x-12}{\sqrt{x}}$$

The equation defining g/f is $\left(\frac{g}{f}\right)(x) = \underline{\frac{x-12}{\sqrt{x}}}$.

The domain of g/f is $(0, \infty)$.
(Type your answer in interval notation.)

26. Let $f(x) = -3x - 1$ and $g(x) = x^2 + 1$.

Find $f(g(0))$.

$$f(g(0)) = -4$$

$$f(g(0)) \Rightarrow g(0) = 0^2 + 1 = 1$$

$$f(1) = -3(1) - 1 = -4$$

27. Let $f(x) = 3x + 6$, $g(x) = x^2 + 4$, $h(x) = \frac{x-6}{3}$.

Find $(g \circ h \circ f)(6)$.

$$(g \circ h \circ f)(6) = 40$$

(Simplify your answer. Type an integer or a decimal.)

$$f(6) = 3 \cdot 6 + 6 = 24$$

$$h(24) = \frac{24-6}{3} = \frac{18}{3} = 6$$

$$g(6) = 6^2 + 4 = 36 + 4 = 40$$

28. For $f(x) = 5x - 3$ and $g(x) = 4x^2 - 5$, find the following function.

$(f \circ g)(x)$

$$(f \circ g)(x) = 20x^2 - 28$$

(Simplify your answer.)

$$f(g(x)) = 5(4x^2 - 5) - 3$$

$$= 20x^2 - 25 - 3$$

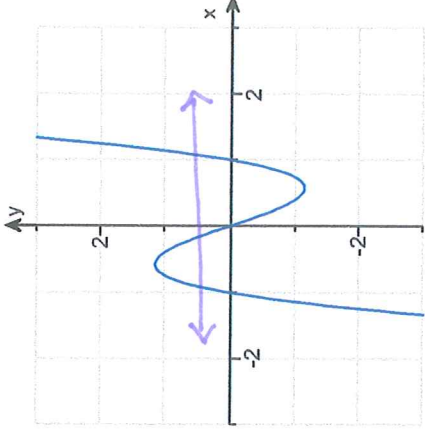
$$= 20x^2 - 28$$

29. Use the horizontal line test to determine whether the function is one-to-one.

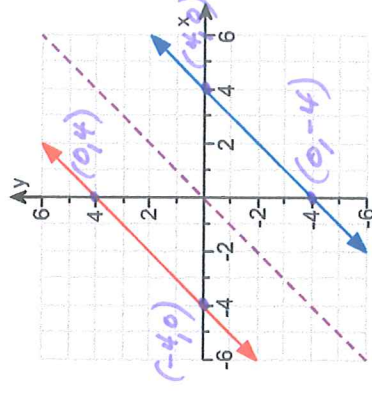
$$f(x) = 3x^3 - 3x$$

Is the function one-to-one?

- Yes
 No



30. Determine whether the given pair of functions graphed to the right are inverses of each other.



- Is the pair of functions shown in the graph inverses of each other?

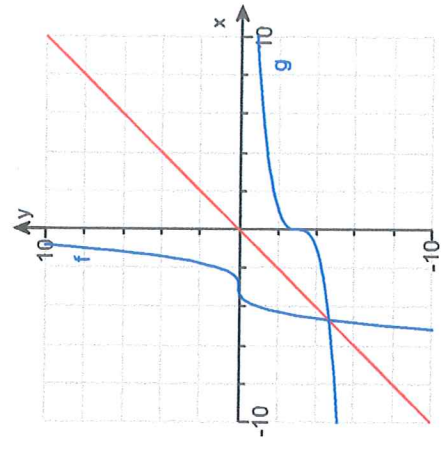
- Yes
 No

31. Determine whether the pair of functions f and g are inverses of each other.

Are the functions inverses of each other?

- Yes
- No

They reflect onto each other across the line $y = x$.



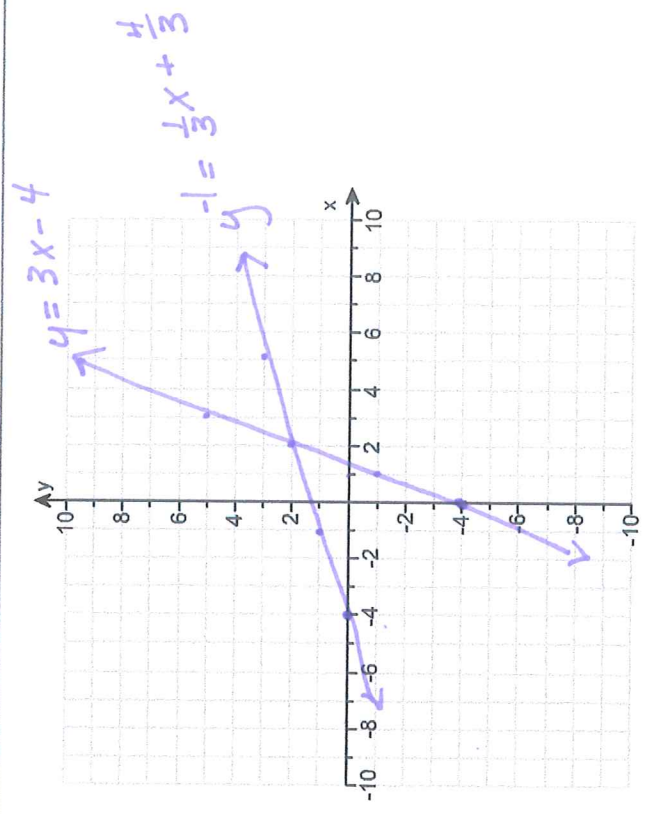
32. Find the inverse of the following function graph both f and f^{-1} on the same coordinate plane.

$y = 3x - 4$

The inverse function is $f^{-1}(x) = \frac{1}{3}x + \frac{4}{3}$.

Use the graphing tool to graph the functions.

Handwritten work for finding the inverse:
 $x = 3y - 4$
 $x + 4 = 3y$
 $\frac{x + 4}{3} = y$
 $\frac{1}{3}x + \frac{4}{3} = y = f^{-1}(x)$



33. Find the inverse of the following function and graph both f and f^{-1} on the same coordinate plane.

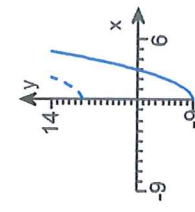
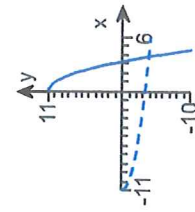
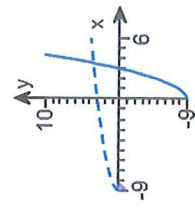
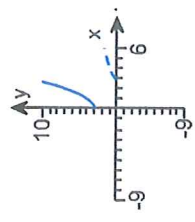
$f(x) = x^2 - 9$ for $x \geq 0$

$y = x^2 - 9$
 $x = y^2 - 9$
 $x + 9 = y^2$
 $\sqrt{x+9} = y$

$f^{-1}(x) = \sqrt{x+9}$

Choose the correct graph below. Note that the graph of $f^{-1}(x)$ is represented by dashed line and $f(x)$ is represented by solid line.

- A.
- B.
- C.
- D.



34. Find the inverse of the function. Then graph both f and f^{-1} on the same coordinate plane.

$f(x) = \sqrt{x} + 1$

$y = \sqrt{x} + 1$
 $x = \sqrt{y} + 1$

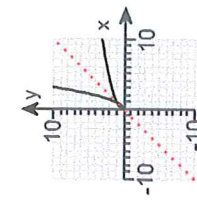
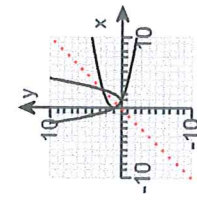
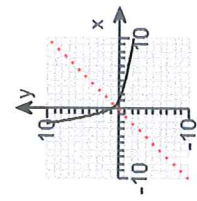
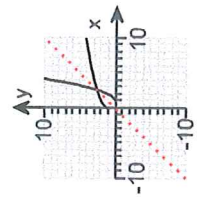
Find the inverse of the function.

$f^{-1}(x) = (x-1)^2, [1, \infty)$

$x-1 = \sqrt{y}$
 $(x-1)^2 = y$

Choose the graph that shows both f and f^{-1} on the same coordinate plane.

- A.
- B.
- C.
- D.



35. Find the inverse of the function.

$v(x) = (x-5)^2$ for $x \geq 5$

$y = (x-5)^2$
 $x = (y-5)^2$
 $\sqrt{x+5} = y-5$
 $\sqrt{x+5} + 5 = y$

$v^{-1}(x) = \sqrt{x+5}, x \geq 0$