

x	-4	-3	-2	-1	0	1	2	3	4	8	9
$f(x)$	0	1	3	-5	-1	7	-3	5	2	-2	-6

Selected values of the continuous function $f(x)$ are shown in the table above. Use the values in the table to answer the following.

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

(a) Find $g(1)$. (b) Find $g(-2)$. (c) If $g(k) = -7$, find k .

2. Let $h(x) = 5 - f(2x)$.

(a) Find $h(2)$. (b) Find $h(0)$. (c) Find $h^{-1}(4)$.

3. Let $p(x)$ be the function that results from applying three transformations to the graph of f in this order: a horizontal dilation by a factor of 3, a reflection over the x axis, and a vertical translation by -4 units.

(a) Find $p(3)$. (b) Find $p(-6)$. (c) If $p(x) = f(x)$, find x .

4. Let $m(x) = af(bx) + c$, where a , b , and c are positive constants. The graph of m can be constructed by applying three transformations to the graph of f in this order: a horizontal dilation by a factor of $\frac{1}{2}$, a vertical dilation by a factor of $\frac{1}{2}$, and a vertical translation by 3 units.

(a) Find $m(-2)$. (b) Find $m(4)$. (c) If $m(k) = 0$, find k .

x	-3	-1	0	1	3	4	6	9
$g(x)$	-4	2	3	6	1	-1	-5	-2

Selected values of the continuous function $g(x)$ are shown in the table above. Use the values in the table to answer the following.

5. Let $h(x) = -2g(x - 3) - 5$.

6. Let $n(x) = 2 + g\left(\frac{x}{3}\right)$.

7. Let $p(x)$ be the function that results from applying three transformations to the graph of g in this order:
 a horizontal dilation by a factor of $\frac{1}{2}$, a reflection over the y axis, and a vertical translation by 1 unit.

- (a) Find $p(-2)$.
 (b) Find the average rate of change of p over the interval $\left[-\frac{1}{2}, \frac{1}{2}\right]$.

8. Let $s(x) = ag(bx) + c$, where a , b , and c are positive constants. The graph of s can be constructed by applying three transformations to the graph of g in this order: a horizontal dilation by a factor of 3, a vertical dilation by a factor of 4, and a vertical translation by -5 units.

x	-5	-2	-1	2	3	4	6	12	15
$h(x)$	6	1	0	-3	-2	2	8	11	9

Selected values of the continuous function $h(x)$ are shown in the table above. Use the values in the table to answer the following.

9. Let $h(x) = 6f(x + 2) - 3$.

10. Let $h(x) = -2g\left(\frac{x}{2}\right)$.

- (a) Find $g(6)$. (b) If $g(x) = 1$, find x .

(c) Put the following in order from least to greatest: $g(-1)$, $g(1)$, $g(2)$.

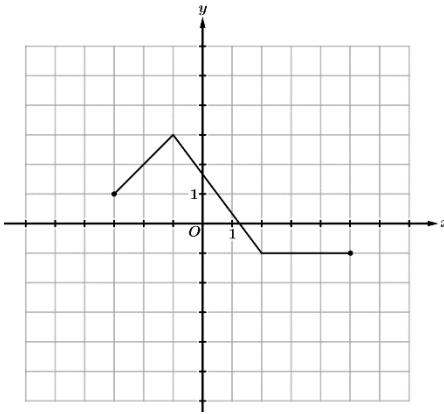
11. Let $h(x)$ be the function that results from applying three transformations to the graph of j in this order:

a horizontal dilation by a factor of $\frac{1}{3}$, a vertical dilation by a factor of 2, and a vertical translation by -4 units.

- (a) Find $j(6)$. (b) Find $j(-3)$.

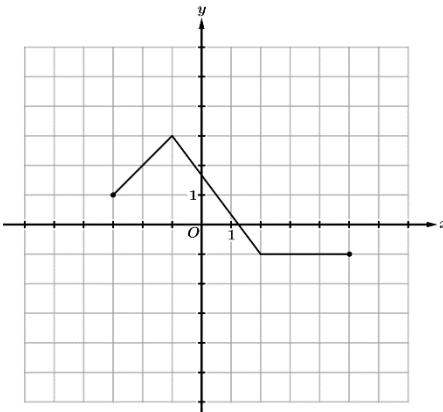
12. Let $w(x) = 2h(x - 3) + 1$

- (a) Find $w(-2) \cdot h(6)$. (b) Find $w(h(-5))$. (c) Find $w(w(2))$.



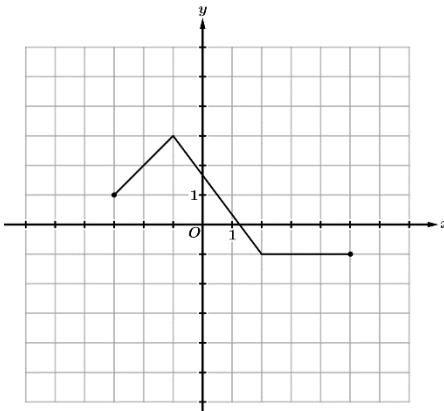
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

13. Let $g(x) = -2f(x + 1)$. Sketch the graph of $g(x)$ on the same axes as $f(x)$ above.



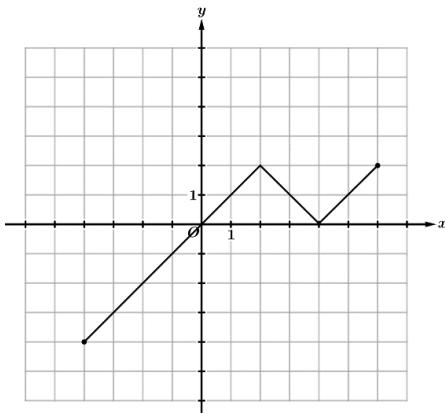
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

14. Let $h(x) = f(2x) - 3$. Sketch the graph of $h(x)$ on the same axes as $f(x)$ above.



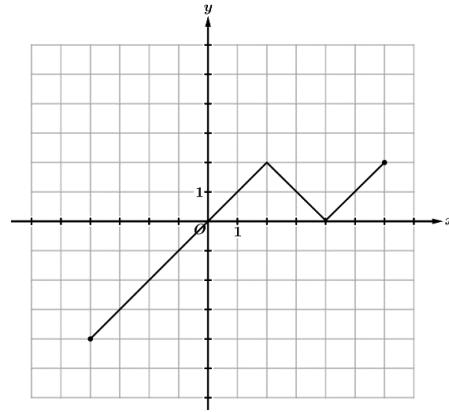
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

15. Let $f(x) = 2k(x - 2) - 1$. Sketch the graph of $k(x)$ on the same axes as $f(x)$ above.



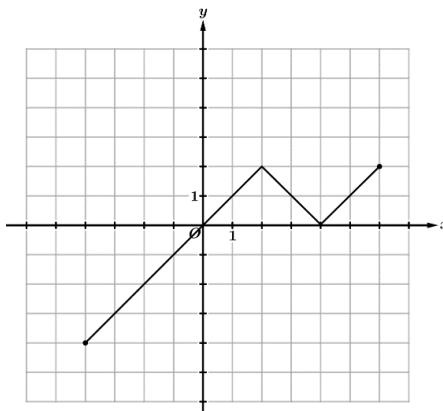
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

16. Let $g(x) = 1 - f(2x)$. Sketch the graph of $g(x)$ on the same axes as $f(x)$ above.



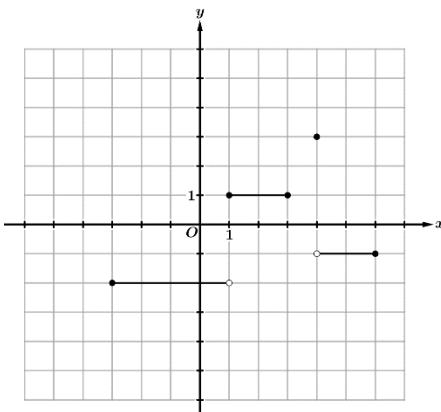
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

17. Let $h(x) = f(x - 2) + 3$. Sketch the graph of $h(x)$ on the same axes as $f(x)$ above.



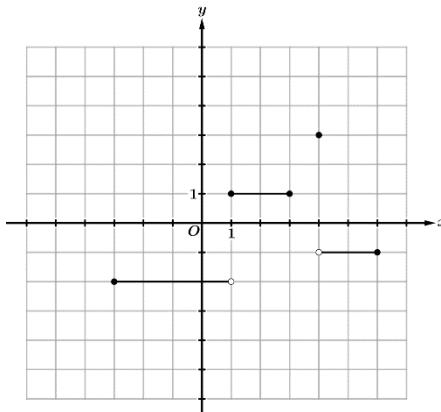
The graph of $f(x)$ is shown in the figure above and consists of three line segments.

18. Let $f(x) = 2k(x + 1)$. Sketch the graph of $k(x)$ on the same axes as $f(x)$ above.



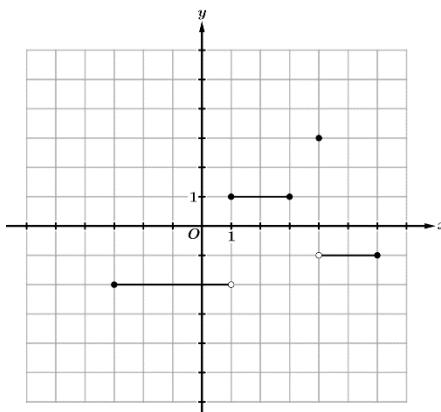
The graph of $f(x)$ is shown in the figure above and consists of three linear pieces and a point at $(4, 3)$.

19. Let $g(x) = 2f(x + 3) - 1$. Sketch the graph of $g(x)$ on the same axes as $f(x)$ above.



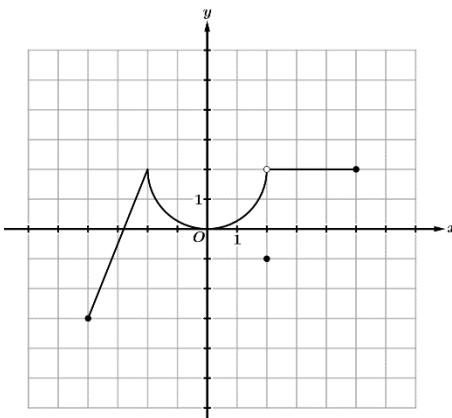
The graph of $f(x)$ is shown in the figure above and consists of three linear pieces and a point at $(4, 3)$.

20. Let $h(x) = f(2x - 2) - 4$. Sketch the graph of $h(x)$ on the same axes as $f(x)$ above.



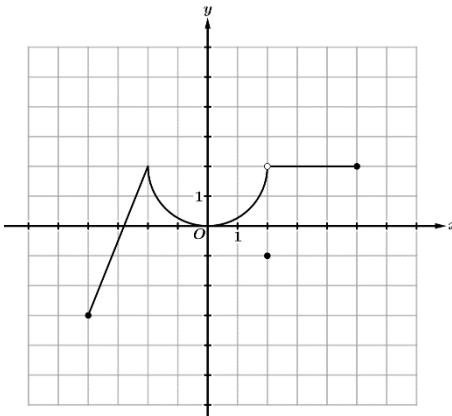
The graph of $f(x)$ is shown in the figure above and consists of three linear pieces and a point at $(4, 3)$.

21. Let $k(x)$ be the function that results from applying three transformations to the graph of f in this order: a vertical dilation by a factor of 2, a reflection over the y axis, and a vertical translation by -1 unit. Sketch the graph of $k(x)$ on the same axes as $f(x)$ above.



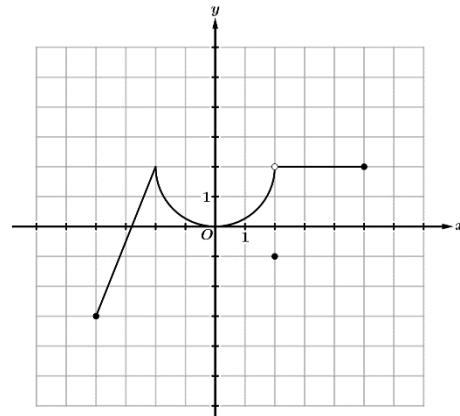
The graph of $f(x)$ is shown in the figure above and consists of two linear pieces, a semi-circle, and a point at $(2, -1)$.

22. Let $g(x) = -f(2x)$. Sketch the graph of $g(x)$ on the same axes as $f(x)$ above.



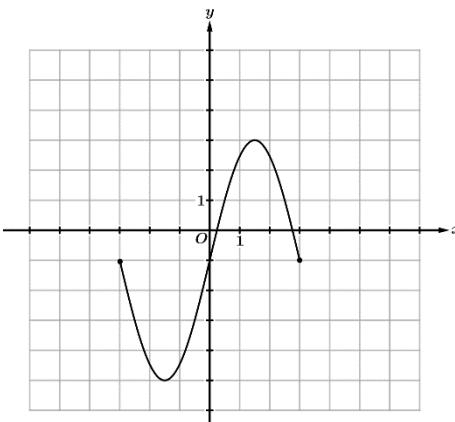
The graph of $f(x)$ is shown in the figure above and consists of two linear pieces, a semi-circle, and a point at $(2, -1)$.

23. Let $h(x) = f(-x) + 2$. Sketch the graph of $h(x)$ on the same axes as $f(x)$ above.



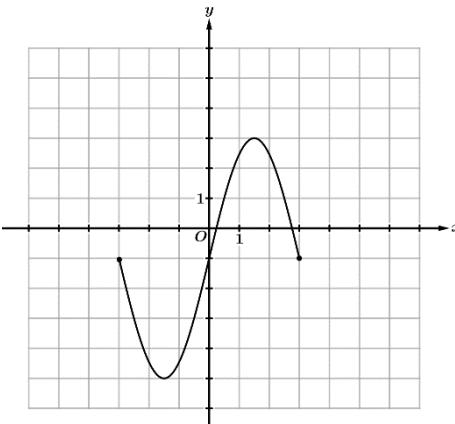
The graph of $f(x)$ is shown in the figure above and consists of two linear pieces, a semi-circle, and a point at $(2, -1)$.

24. Let $k(x)$ be the function that results from applying three transformations to the graph of f in this order: a horizontal dilation by a factor of $\frac{1}{2}$, a reflection over the x axis, and a vertical translation by 2 units. Sketch the graph of $k(x)$ on the same axes as $f(x)$ above.



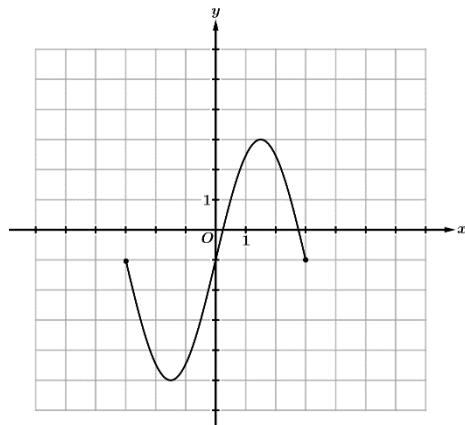
The graph of $f(x)$ is shown in the figure above and has the domain $[-3, 3]$ and the range $[-5, 3]$.

25. Let $g(x) = f(x + 2) - 1$. Sketch the graph of $g(x)$ on the same axes as $f(x)$ above.



The graph of $f(x)$ is shown in the figure above and has the domain $[-3, 3]$ and the range $[-5, 3]$.

26. Let $h(x) = 1 - f\left(\frac{x}{2}\right)$. Sketch the graph of $h(x)$ on the same axes as $f(x)$ above.



The graph of $f(x)$ is shown in the figure above and has the domain $[-3, 3]$ and the range $[-5, 3]$.

27. Let $k(x) = -3f(2x) + 1$.

Find the domain and range of $k(x)$.

28. Let $p(x) = \frac{1}{2}f(x + 3) - 4$.

Find the domain and range of $p(x)$.

29. The graph of $f(x)$ has zeros at $x = -2, 0$, and 3 . Find the zeros of the following functions.

(a) $g(x) = 2f(x - 4)$

(b) $h(x) = -\frac{1}{3}f(2x)$

(c) $k(x) = -5f(3x - 2)$

30. The graph of $f(x)$ has the vertical asymptote $x = -2$ and horizontal asymptote $y = 3$. Find the vertical and horizontal asymptotes of the following functions.

(a) $g(x) = 2f(x + 1) - 3$

(b) $h(x) = 4 - 3f\left(\frac{x}{5}\right)$

(c) $k(x) = \frac{1}{2}f(4 - 2x) + 3$

31. The graph of $f(x)$ is continuous where $\lim_{x \rightarrow -\infty} f(x) = 4$ and $\lim_{x \rightarrow \infty} f(x) = -\infty$.

(a) If $g(x) = -2f(x + 7) + 5$, find $\lim_{x \rightarrow -\infty} g(x)$ and $\lim_{x \rightarrow \infty} g(x)$.

(b) If $h(x) = -f(-x)$, find $\lim_{x \rightarrow -\infty} h(x)$ and $\lim_{x \rightarrow \infty} h(x)$.

32. The graph of $f(x)$ has the vertical asymptote $x = 5$ and horizontal asymptote $y = -3$. Find the vertical and horizontal asymptotes of the following functions that result from transforming the graph of f .

(a) The graph of g results from applying the following transformations to graph of f in this order:
vertical dilation by a factor of 3, reflection over the x axis, reflection over the y axis, and a horizontal translation by -3 units.

(b) The graph of h results from applying the following transformations to graph of f in this order:
horizontal dilation by a factor of 2 and a horizontal translation by 4 units.

33. Let $f(x) = x^2 + 4x + 1$. Write an equation of the following functions that are transformations of $f(x)$.

(a) $g(x) = 3f(x) - 7$

(b) $h(x) = -2f(x) + 2$

(c) $k(x) = f(x - 2)$

(d) $m(x) = f\left(\frac{x}{2}\right) + 3$

(e) $p(x) = 2f(x + 1) - 5$

(f) $s(x) = -f(-x)$

34. Let $f(x) = \frac{x-1}{(x+2)(x-3)}$. Write an equation of the following functions that are transformations of $f(x)$.

(a) $g(x) = f(x + 4)$

(b) $h(x) = -2f\left(\frac{x}{3}\right)$

(c) $k(x) = f(4 - x)$

35. Let $f(x) = 2x^2 - 3$. Write an equation of the following functions that are transformations of $f(x)$.

(a) $g(x) = f(2x - 3) + 2$

(b) $h(x) = 4f(x) + 1$

(c) $k(x)$ results when the graph of f has a horizontal dilation by a factor of 3, followed by a horizontal translation by -5 units, and a vertical translation by 2 units.