Name

Functional Equations - Transformations and Structure



1 What is $f(3)$?

$$f(n) = 1f(n-1) + 1f(n-2)$$
$$f(1) = 2$$
$$f(2) = 0$$
$$n \geq 3$$

A	3	B	4
C	1	D	2

2 What is $f(7)$?

$$f(n) = 1f(n-1) + 1f(n-2)$$
$$f(1) = 3$$
$$f(2) = 3$$
$$n \geq 3$$

A	38	B	40
C	41	D	39

3 What is $f(3)$?

$$f(n) = 2f(n-1) + 2f(n-2)$$
$$f(1) = 2$$
$$f(2) = 0$$
$$n \geq 3$$

A	5	B	4
C	6	D	3

4 What is $f(7)$?

$$f(n) = 3f(n-1) + 2f(n-2)$$
$$f(1) = -1$$
$$f(2) = 3$$
$$n \geq 3$$

A	1206	B	1209
C	1207	D	1208

5 Which recurrence rule matches the table?

A

$$f(1) = 5$$
$$f(n) = f(n-1) + 1$$
$$n \geq 2$$

B

$$f(1) = 5$$
$$f(n) = f(n-1) + 2$$
$$n \geq 2$$

C

$$f(1) = 5$$
$$f(n) = f(n-1) + 4$$
$$n \geq 2$$

D

$$f(1) = 5$$
$$f(n) = f(n-1) + 3$$
$$n \geq 2$$

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6 Which table lists $f(1)$ through $f(4)$?

$$f(1) = 4$$
$$f(n) = f(n-1) - 4$$
$$n \geq 2$$

7 Using the mapping notation, how does this variable value transform the graph of f?

A: shift down by 4

B: shift right by 4

C: vertically stretch by a factor of 4

D: shift left by 4

8 Using the mapping notation, which variable and value produce this transformation?

A: a = 2

B: b = 2

C: h = 2

D: k = 2

9 How is the graph of f transformed to produce g?

A: shift up by 3

B: shift left by 3

C: vertically stretch by a factor of 3

D: shift right by 3

10 Which equation follows at -x?

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

A: $2f(-x) + f(x) = 2x + 4$

B: $2f(-x) + f(x) = 3x + 5$

C: $2f(-x) + f(x) = 2x + 2$

D: $2f(-x) + f(x) = 2x + 3$

11 Which rule defines f(x)?

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

A: $f(x) = -2x + 2$

B: $f(x) = -3x - 1$

C: $f(x) = -3x$

D: $f(x) = -3x + 1$

12 For x != 0, which rule defines f(x)?

$$2f(x) - 3f(1/x) = 3x^2 - 3\frac{1}{x^2}$$

A: $f(x) = \frac{3x^2 - 3\frac{1}{x^2}}{5}$

B: $f(x) = \frac{3x^2 - 4\frac{1}{x^2}}{5}$

C: $f(x) = \frac{3x^2 - 2\frac{1}{x^2}}{5}$

D: $f(x) = \frac{4x^2 - \frac{1}{x^2}}{5}$

13 Does this identity determine a unique function on all real x?

$$f(x) + f(x+1) = -4x - 2$$

A: No; no function can satisfy the identity.

B: No; an alternating term t(x) with t(x+1) = -t(x) can be added to an affine solution.

C: Yes; substituting x = 0 determines every value of f.

D: Yes; the affine solution is the only possible solution.

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14 For x != 0, which equation follows at 1/x?

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

A $2f(1/x) - 3f(x) = 4x^2 - \frac{1}{x^2}$

B $2f(1/x) - 3f(x) = 3x^2 - 2\frac{1}{x^2}$

C $2f(1/x) - 3f(x) = 3x^2 - 4\frac{1}{x^2}$

D $2f(1/x) - 3f(x) = 3x^2 - 3\frac{1}{x^2}$

15 What does this transformation produce in f(x)?

$$g(x) = f(x+p)$$

A $\text{Shift left}: \ p$

B $\text{Shift right}: \ p$

16 What does this transformation produce in f(x)?

$$g(x) = f(-x)$$

A $\text{Reflect in Y} - \text{Axis}$

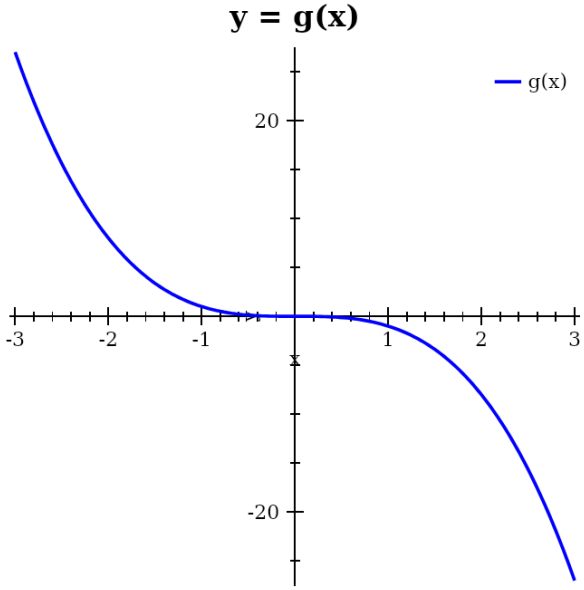
B $\text{Reflect in X} - \text{Axis}$

17 Which graph shows this transformation of f(x) into g(x)?

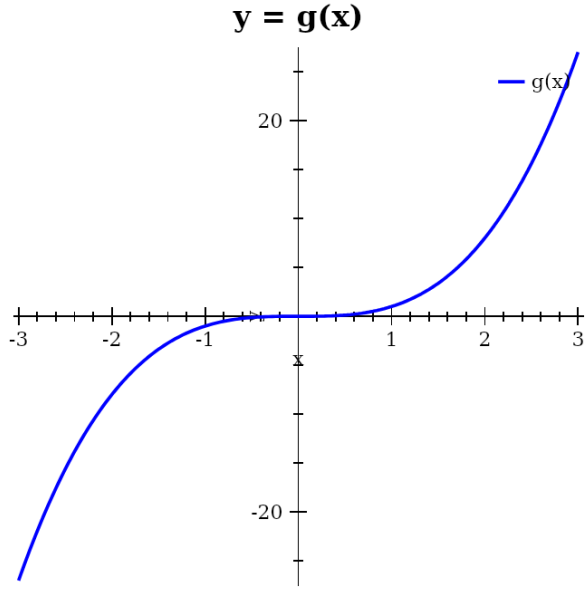
$$f(x) = x^3$$

$$\text{Reflect in Y} - \text{Axis}$$

A



B



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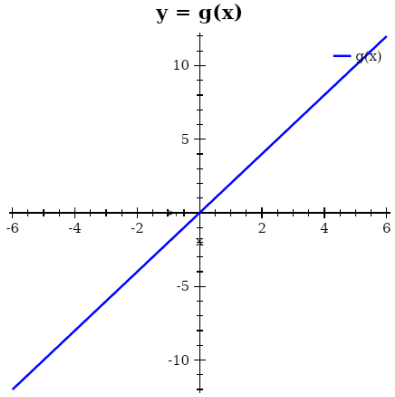
18 What transformation of f(x) does this graph show?



A

$$f(x) = x$$
$$\text{Vertical compression}: \ 2$$

B

$$f(x) = x$$
$$\text{Vertical stretch}: \ 2$$

19 Which function g(x) shows this transformation of f(x)?

$$\text{Vertical compression}: \ r$$

A

$$g(x) = r \cdot f(x)$$
$$r > 1$$

B

$$g(x) = f(r \cdot x)$$
$$r > 1$$

C

$$g(x) = r \cdot f(x)$$
$$r < 1$$

20 Which function g(x) shows this transformation of f(x)?

$$\text{Reflect in Y} - \text{Axis}$$

A

$$g(x) = -f(x)$$

B

$$g(x) = f(-x)$$

21 Which function g(x) shows these transformations of f(x)?

$$\text{Reflect in X} - \text{Axis}$$
$$\text{Shift down}: \ m$$

A

$$g(x) = -f(x) + m$$

B

$$g(x) = f(-x) - m$$

C

$$g(x) = -f(x) - m$$

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22 What does this transformation produce in f(x)?

$$g(x) = -f(x+m)$$

A

$\text{Reflect in X} - \text{Axis}$
$\text{Shift right}: \ m$

B

$\text{Reflect in X} - \text{Axis}$
$\text{Shift left}: \ m$

C

$\text{Reflect in Y} - \text{Axis}$
$\text{Shift left}: \ m$

23 What does this transformation produce in f(x)?

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

A

$\text{Reflect in Y} - \text{Axis}$
$\text{Shift down}: \ 3$

B

$\text{Reflect in Y} - \text{Axis}$
$\text{Shift right}: \ 3$

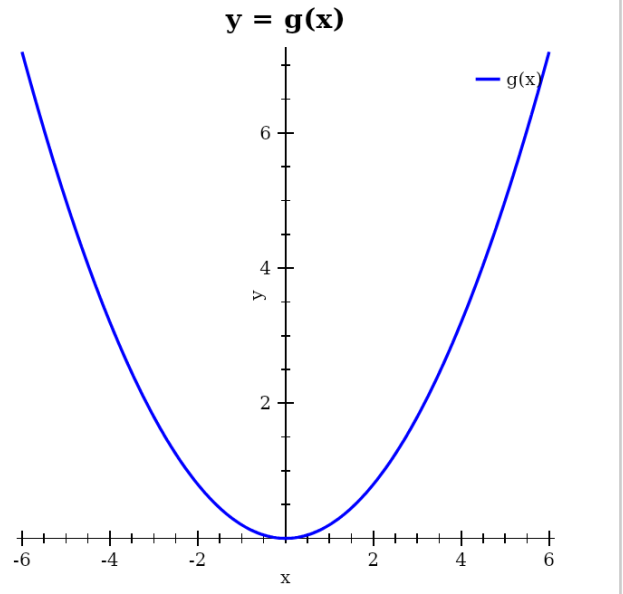
C

$\text{Reflect in Y} - \text{Axis}$
$\text{Shift up}: \ 3$

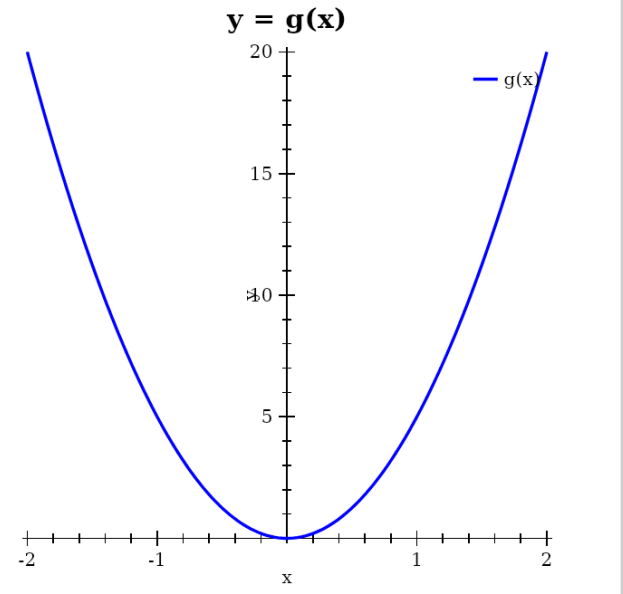
24 Which graph shows the transformation of f(x) into g(x)?

$$f(x) = x^2$$
$$g(x) = 5f(x)$$

A



B



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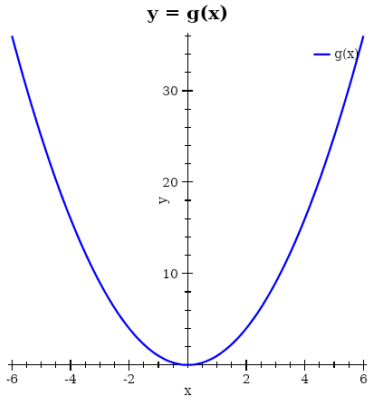
25 Which transformed function g(x) is this graph showing?



A
$$f(x) = x^2$$
$$g(x) = f(-x)$$

B
$$f(x) = x^2$$
$$g(x) = -f(x)$$

26 Which function g(x) shows these transformations of f(x)?

$$\text{Reflect in X} - \text{Axis}$$
$$\text{Vertical stretch}: \ 2$$

A $g(x) = -2f(x)$

B $g(x) = -f(2x)$

C $g(x) = 2f(-x)$

27 What is f(0)?

$$f(x+y) = f(x) + f(y), \quad f(1) = -4$$

A	B
-1	0
C	D
1	2

28 What is f(3)?

$$f(x+y) = f(x) + f(y), \quad f(1) = -2$$

A	B
-6	-7
C	D
-5	-4

29 What is f(-5)?

$$f(x+y) = f(x) + f(y), \quad f(5) = -4$$

A	B
4	3
C	D
6	5

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30 What is f(-2)?

$$f(x)+3f(-2)=-4x-4$$

A 0	B 2
C 1	D 3

31 What is f(2)?

$$f(x)+3f(-3)=4x-2$$

A 33/2	B 35/2
C 37/2	D 31/2

32 Which rule defines f(x)?

$$f(x)+f(0)=-x+10$$

A	$f(x)=-x+4$
B	$f(x)=7$
C	$f(x)=-x+5$
D	$f(x)=-x+6$

33 Assume f is affine. Which rule defines f(x)?

$$f(x)+f(x+3)=4x+1$$

A $f(x)=2x-\frac{7}{2}$	B $f(x)=3x-\frac{1}{2}$
C $f(x)=2x-\frac{3}{2}$	D $f(x)=2x-\frac{5}{2}$

34 Which equation follows after replacing x by x-3?

$$f(x)+f(x-3)=4x-7$$

A	$f(x-3)+f(x-6)=5x-17$
B	$f(x-3)+f(x-6)=4x-20$
C	$f(x-3)+f(x-6)=4x-18$
D	$f(x-3)+f(x-6)=4x-19$

35 What is f(1)?

$$f(xy)=f(x)f(y),\quad f(4)=2$$

A 2	B 3
C 1	D 0

36 What is f(125)?

$$f(xy)=f(x)f(y),\quad f(5)=5$$

A 125	B 124
C 126	D 127