CHAPTER 2.6

Transformation of Functions

Multiple-Choice Old Exam Questions

27 questions • 4 topics • options A–E • two questions per page

Topic 1 | Even and Odd Functions

Deciding whether a function is even, odd or neither • Questions 1–8

Q **1**

Which one of the following statements is TRUE about the function $f(x) = \frac{x|x|}{\sqrt[3]{x}}$?

A) f is an even function

B) f is an odd function

C) f is neither an odd function nor an even function

D) $f(-18) = -f(18)$

E) $f(0) = 0$

Q **2**

Which one of the following is an even function?

A) $h(x) = \frac{\sqrt[3]{x}}{x^3 - x}$

B) $h(x) = x + \frac{1}{x}$

C) $h(x) = 3 - \sqrt[3]{x}$

D) $h(x) = |x| - x$

E) $h(x) = x^2 + x$

Q
3

Which one of the following statements is TRUE?

A) $f(x) = x^4 - |x^3| + 13$ is an even function

B) $f(x) = 3|x|$ is an odd function

C) $f(x) = 2 + 4x + x^2$ is an even function

D) $f(x) = x^3 - 5$ is an odd function

E) $f(x) = \sqrt{7 - x^2}$ is neither an even nor an odd function

Q
4

Which one of the following statements is TRUE?

A) $f(x) = x|x|$ is an odd function

B) $f(x) = 5$ is an odd function

C) $f(x) = x|x|$ is an even function

D) $f(x) = 5$ is neither odd nor even

E) $y = x^3$ is an even function

Q 5

Let $f(x)$ be any nonzero function. Then $g(x) = \frac{1}{2}[f(x) + f(-x)]$ is

A) odd

B) neither odd nor even

C) both even and odd

D) constant

E) even

Q 6

Which one of the following statements is TRUE?

A) $f(x) = x^2 - |x|$ is an even function

B) $f(x) = 4 + \sqrt[3]{x}$ is an even function

C) $f(x) = 5$ is an odd function

D) $f(x) = x^5 + x^3 + 1$ is an odd function

E) $f(x) = \frac{x^2}{x^2+1}$ is neither odd nor even

Q
7

Which of the following equations defines an odd function?

A) $y = |x^3|$

B) $y = 2x + 1$

C) $y = \frac{6x^2+x^4}{x^3+2x}$

D) $y = x\sqrt[3]{x^5 - x}$

E) $y = \frac{\sqrt{4x-x^3}}{x^7+1}$

Q
8

Which ONE of the following is TRUE about the functions $f(x) = x(x + 1)(x - 1)$ and $g(x) = x\sqrt[3]{x}$?

A) f is odd and g is even

B) f is even and g is odd

C) f and g are both even

D) f and g are both odd

E) neither f nor g is even or odd

Topic 2 | Horizontal and Vertical Shifts

Translating graphs and equations left, right, up and down • Questions 9–16

Q **9**

The graph of the equation $y = |x + 3| - 2$ may be obtained from the graph of $y = |x - 1| + 3$ by the following translations:

A) Four units to the left and five units down

B) Four units to the right and two units down

C) Three units to the left and two units down

D) Three units to the right and five units down

E) Two units to the left and one unit down

Q **10**

If the graph of $y = x^2 + x + 1$ is shifted left horizontally 2 units and shifted down vertically 7 units, then the equation of the new graph is

A) $y = x^2 + 5x$

B) $y = x^2 + 4x$

C) $y = x^2 - 3x - 4$

D) $y = x^2 + 4x - 3$

E) $y = x^2 + 5x - 7$

Q
11

The graph of the equation $y^2 = x^2 + 6x - 2y + 8$ is the graph of $y^2 = x^2$ shifted

A) down vertically 1 unit and left horizontally 3 units

B) down vertically 2 units and left horizontally 3 units

C) down vertically 3 units and left horizontally 1 unit

D) down vertically 1 unit and left horizontally 2 units

E) up vertically 1 unit and right horizontally 3 units

Q
12

The graph of the equation $(x + 1)^2 + (y - 2)^3 = 4$ may be obtained from the graph of $x^2 + y^3 = 4$ by means of the following translations:

A) Two units to the left and one unit up

B) Two units to the right and one unit down

C) One unit to the right and two units up

D) One unit to the right and two units down

E) One unit to the left and two units up

Q
13

If the graph of the equation $x = y^2 + y$ is shifted one unit to the left and two units upward, then the equation of the new graph is

A) $x = y^2 - 3y + 3$

B) $x = y^2 - 3y + 1$

C) $x = y^2 + 5y + 5$

D) $x = y^2 + 2y + 7$

E) $x = y^2 + y$

Q
14

If the graph of the equation $Ax^2 + By^2 + Cx + Dy + E = 0$ is obtained from $2x^2 - 3y^2 = 6$ by means of a horizontal translation of three units to the left and a vertical translation of three units upward, then $A + B + C + D + E$ is equal to

A) 14

B) -14

C) 41

D) -41

E) 0

Q
15

By translating the graph of the equation $(x+1)^2+(y-2)^3=1$ two units to the right and two units downward, the equation of the new graph is

A) $(x+3)^2+(y-4)^3=1$

B) $x^2-2x+y^3=0$

C) $(x-1)^2+(y-4)^3=1$

D) $x^2+y^3=2$

E) $(x+1)^2+(y-2)^3=5$

Q
16

If $f(2)=-7$, then which of the following points must be on the graph of the function $h(x)=f(x-1)+3$?

A) $(3,\ 4)$

B) $(-2,\ 7)$

C) $(-2,\ 10)$

D) $(3,\ -4)$

E) $(-1,\ -10)$

Topic 3 | Reflections, Shifts and Transformed Points

Combining reflections with shifts, and finding points on transformed graphs • Questions 17–24

Q **17**

If the graph of the function $f(x) = 1 - \sqrt{x-1}$ is reflected across the y-axis, then shifted 2 units to the right and 3 units upward, then the equation of the new graph is

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

B) $y = 4 - \sqrt{-x-1}$

C) $y = 4 - \sqrt{-x-3}$

D) $y = 4 - \sqrt{-x+3}$

E) $y = 4 - \sqrt{-x-2}$

Q **18**

If the graph of $f(x) = \sqrt{x-1} + 1$ is reflected across the y-axis, then shifted left horizontally 5 units and up vertically 3 units, then the equation of the new function $g(x)$ is

A) $g(x) = \sqrt{-x-6} + 4$

B) $g(x) = -\sqrt{x-6} + 4$

C) $g(x) = -\sqrt{-x-6} + 3$

D) $g(x) = \sqrt{-x-6} + 3$

E) $g(x) = \sqrt{-x-6} + 2$

Q
19

The graph of the function $f(x) = \sqrt{-x}$ is reflected across the y-axis, shifted 2 units to the right and then 1 unit downward. If the equation of the new graph is $g(x) = \sqrt{x + b} + c$, then $b + c =$

A) -3

B) 2

C) -2

D) -1

E) 3

Q
20

Let $f(x) = x^2 - 2x$. If g is obtained from f by reflecting its graph across the y-axis, shifting 1 unit right and then 1 unit upward, then $g(x) =$

A) x^2

B) $x^2 - 1$

C) $x^2 - 2x$

D) $x^2 - 2x + 2$

E) $x^2 + 2x + 1$

Q
21

Let f be a function such that $f(-1) = 3$ and $f(2) = -4$. The coordinates of two points on the graph of $y = 3f(-x) - 2$ are

A) $(1, 7), (-2, -14)$

B) $(1, 1), (-2, -14)$

C) $(1, 7), (2, 2)$

D) $(1, 7), (2, 4)$

E) $(-1, 1), (2, 6)$

Q
22

If $f(x)$ is an even function such that $f(-3) = 4$, then the coordinates of two points that must lie on the graph of $y = 3f(2x)$ are

A) $\left(\frac{3}{2}, 12\right)$ and $\left(-\frac{3}{2}, 12\right)$

B) $\left(6, \frac{4}{3}\right)$ and $\left(-6, \frac{4}{3}\right)$

C) $\left(\frac{3}{2}, \frac{4}{3}\right)$ and $\left(-\frac{3}{2}, \frac{4}{3}\right)$

D) $(1, 2)$ and $(-1, 2)$

E) $(6, 12)$ and $(-6, 12)$

Q
23

If $f(-4) = -2$, then the coordinates of a point that lies on the graph of $g(x) = -3f(1 - x) - 2$ are

A) $(5, 4)$

B) $(-3, 4)$

C) $(5, 3)$

D) $(-3, 6)$

E) $(2, 4)$

Q
24

Let f be a function such that $(1, -2)$ is a point on the graph of f. If (a, b) is the corresponding point that lies on the graph of $g(x) = -f(x - 3) + 2$, then $a + b =$

A) 4

B) 6

C) 8

D) 10

E) 12

Topic 4 | Graphs, Domain, Range and True/False Statements

Reading information from graphs and testing statements about functions • Questions 25–27

Q **25**

The domain D and the range R of the function $f(x) = 2 - \sqrt{6 - 3x}$ are respectively given by

A) $D = (-\infty, 2]$ and $R = (-\infty, 2]$

B) $D = (-\infty, 2]$ and $R = [2, \infty)$

C) $D = (-\infty, 2]$ and $R = [2, 6]$

D) $D = [2, \infty)$ and $R = [2, \infty)$

E) $D = [2, \infty)$ and $R = (-\infty, 2]$

Q **26**

Which one of the following statements is FALSE?

A) The function $y = |x - 1|$ is decreasing on $[1, \infty)$

B) The range of the function $y = -|x|$ is $(-\infty, 0]$

C) The graph of a vertical line is not a function

D) The domain of the function $y = \sqrt{-x}$ is $(-\infty, 0]$

E) The function $y = x^3$ is increasing on $(-\infty, \infty)$

Q
27

The graph of $y = f(x)$ is shown. If $E(x) = |x - 1| + 1$, then which one of the following is TRUE?

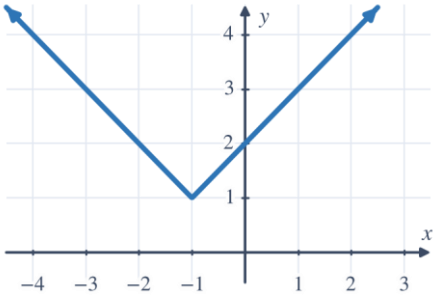
A) $f(x) = -E(x)$

B) $f(x) = E(-x)$

C) $f(x) = E(x - 1)$

D) $f(x) = E(x + 1)$

E) $f(x) = E\left(\frac{x}{2}\right)$



Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**A**	f is an even function
2	4	**A**	$h(x) = \dfrac{\sqrt[3]{x}}{x^3 - x}$
3	13	**A**	$f(x) = x^4 - \lvert x^3 \rvert + 13$ is an even function
4	14	**A**	$f(x) = x\lvert x \rvert$ is an odd function
5	15	**E**	even
6	21	**A**	$f(x) = x^2 - \lvert x \rvert$ is an even function
7	22	**C**	$y = \dfrac{6x^2 + x^4}{x^3 + 2x}$
8	27	**A**	f is odd and g is even
9	6	**A**	Four units to the left and five units down
10	7	**A**	$y = x^2 + 5x$
11	10	**A**	down vertically 1 unit and left horizontally 3 units
12	16	**E**	One unit to the left and two units up
13	17	**B**	$x = y^2 - 3y + 1$
14	11	**A**	14
15	18	**B**	$x^2 - 2x + y^3 = 0$
16	20	**D**	$(3, -4)$
17	3	**A**	$y = 4 - \sqrt{-x + 1}$
18	8	**A**	$g(x) = \sqrt{-x - 6} + 4$
19	23	**A**	-3
20	26	**A**	x^2
21	9	**A**	$(1, 7), (-2, -14)$
22	12	**A**	$\left(\frac{3}{2}, 12\right)$ and $\left(-\frac{3}{2}, 12\right)$
23	24	**A**	$(5, 4)$
24	25	**C**	8
25	2	**A**	$D = (-\infty, 2]$ and $R = (-\infty, 2]$
26	5	**A**	The function $y = \lvert x - 1 \rvert$ is decreasing on $[1, \infty)$
27	19	**B**	$f(x) = E(-x)$