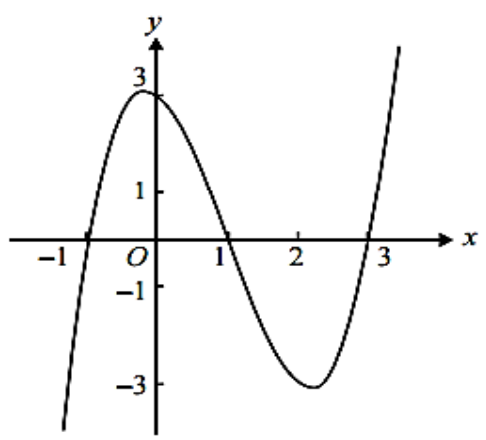


Question 1

The graph of a function f , with domain R , is as shown.

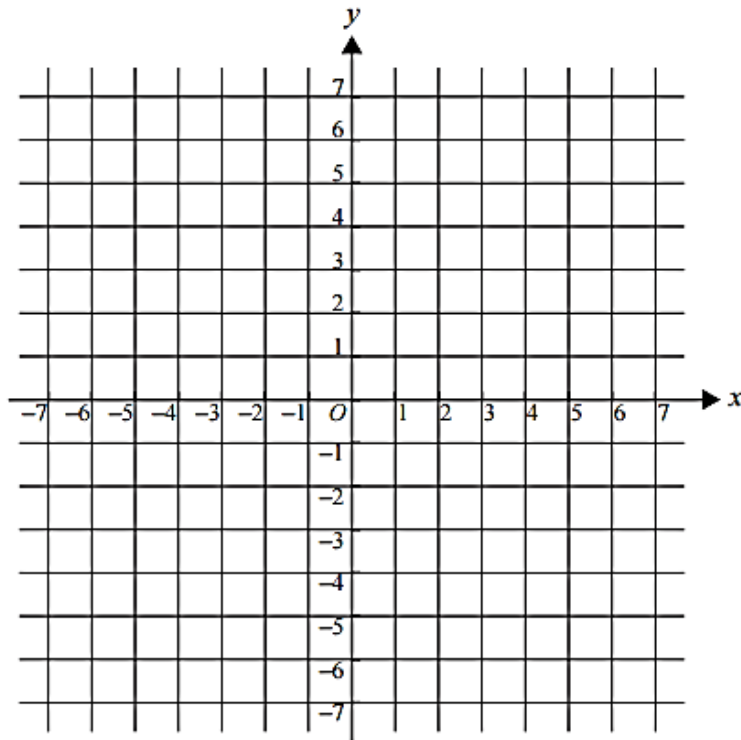


The graph which best represents $1-f(2x)$ is

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

Question 2

- a. Sketch the graph of $f: [-6,0] \rightarrow R, f(x) = -(x+3)^2 + 2$. Label the axes intercepts and endpoints with their coordinates.



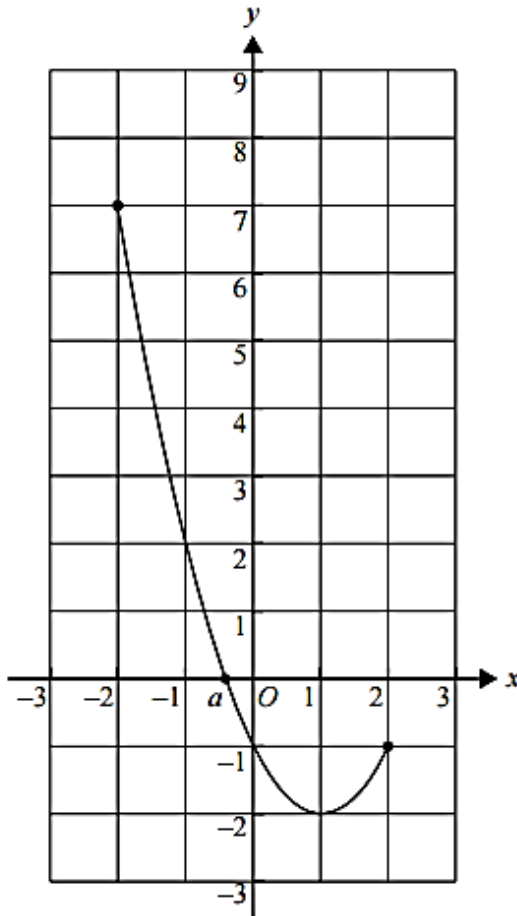
3 marks

- b. i. Find the coordinates of the image of the point $(3, 2)$ under a reflection in the x -axis, followed by a translation of 5 units in the positive direction of the x -axis.

- ii. Find the equation of the image of the graph of f under a reflection in the x -axis, followed by a translation of 5 units in the positive direction of the x -axis.

Question 3

The graph of $f(x) = (x - 1)^2 - 2$, $x \in [-2, 2]$, is shown below. The graph intersects the x -axis where $x = a$.



a. Find the value of a .

1 mark

b. On the axes above, sketch the graph of $g(x) = f(-x) + 1$, for $x \in [-2, 2]$. Label the end points with their coordinates.

2 marks

Question 3 (Continued)

c. The following sequence of transformations is applied to the graph of the function

$g: [-2, 2] \rightarrow R, g(x) = f(-x) + 1.$

- a translation of one unit in the negative direction of the x -axis
- a translation of one unit in the negative direction of the y -axis
- a dilation from the x -axis of factor $\frac{1}{3}$

Find

- i. the rule of the image of g after the sequence of transformations has been applied 2 marks

- ii. the domain of the image of g after the sequence of transformations has been applied. 1 mark

Question 4

The point $P(4, -3)$ lies on the graph of a function f . The graph of f is translated four units vertically up and then reflected in the y -axis.

The coordinates of the final image of P are

- A. $(-4, 1)$
- B. $(-4, 3)$
- C. $(0, -3)$
- D. $(4, -6)$
- E. $(-4, -1)$

Question 5

The transformation that maps the graph of $y = \sqrt{8x^3 + 1}$ onto the graph of $y = \sqrt{x^3 + 1}$ is a

- A. dilation by a factor of 2 from the y -axis.
- B. dilation by a factor of 2 from the x -axis.
- C. dilation by a factor of $\frac{1}{2}$ from the x -axis.
- D. dilation by a factor of 8 from the y -axis.
- E. dilation by a factor of $\frac{1}{2}$ from the y -axis.

Question 6

If $f(x-1) = x^2 - 2x + 3$, then $f(x)$ is equal to

- A. $x^2 - 2$
- B. $x^2 + 2$
- C. $x^2 - 2x + 2$
- D. $x^2 - 2x + 4$
- E. $x^2 - 4x + 6$

Question 7

CAS QUESTION

Let $f: R \rightarrow R, f(x) = (x-3)(x-1)(x^2+3)$ and $g: R \rightarrow R, g(x) = x^4 - 8x$.

- a. Express $x^4 - 8x$ in the form $x(x-a)((x+b)^2+c)$. 2 marks

- b. Describe the translation that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$. 1 mark

- c. Find the values of d such that the graph of $y = f(x+d)$ has
i. one positive x -axis intercept 1 mark

- ii. two positive x -axis intercepts. 1 mark

- d. Find the value of n for which the equation $g(x) = n$ has one solution. 1 mark

Question 7 (Continued)

e. At the point $(u, g(u))$, the gradient of $y = g(x)$ is m and at the point $(v, g(v))$, the gradient is $-m$, where m is a positive real number.

i. Find the value of $u^3 + v^3$.

2 marks

ii. Find u and v if $u + v = 1$.

1 mark

f. i. Find the equation of the tangent to the graph of $y = g(x)$ at the point $(p, g(p))$.

1 mark

ii. Find the equations of the tangents to the graph of $y = g(x)$ that pass through the point with coordinates $\left(\frac{3}{2}, -12\right)$.

3 marks

Question 8

The graph of a function f is obtained from the graph of the function g with rule $g(x) = \sqrt{2x-5}$ reflection in the x -axis followed by a dilation from the y -axis by a factor of $\frac{1}{2}$. Which one of the following is the rule for the function f ?

- A. $f(x) = \sqrt{5-4x}$
- B. $f(x) = -\sqrt{x-5}$
- C. $f(x) = \sqrt{x+5}$
- D. $f(x) = -\sqrt{4x-5}$
- E. $f(x) = -\sqrt{4x-10}$

Question 9

The graph with equation $y = x^2$ is translated 3 units down and 2 units to the right. The resulting graph has equation

- A. $y = (x - 3)^2 + 2$
- B. $y = (x - 2)^2 + 3$
- C. $y = (x - 2)^2 - 3$
- D. $y = (x + 2)^2 - 3$
- E. $y = (x + 2)^2 + 3$