8.2 Transforming Graphs y=f(x): 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the equation of the graph obtained by reflecting y = f(x) in the y-axis.

(Total for Question 1 is 1 mark)

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2 Write the equation of the graph obtained by translating y = f(x) left 4 units and then reflecting in the x-axis.

(Total for Question 2 is 1 mark)

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3 A point (4, -2) lies on y = f(x). Find the image of this point on the graph y = f(x - 3) - 5.

(Total for Question 3 is 2 marks)

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4 The graph y = f(x) passes through points (0, 2) and (1, 5).

(a) Find the image of (0, 2) on y = f(-x) - 4. **(2)**

.....

(b) Find the image of (1, 5) on y = f(-x) - 4. **(2)**

.....

(Total for Question 4 is 4 marks)

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5 The graph of y = g(x) is obtained from y = f(x) by first reflecting in the y-axis and then translating up by 6. Write g(x) in terms of f.

(Total for Question 5 is 1 mark)

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6 A point (3, -2) lies on y = f(x). Find the image of this point on the graph y = -f(-(x + 1)) + 5. Show your working.

(Total for Question 6 is 3 marks)

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7 The graph of y = g(x) is obtained from the graph of y = f(x) by a single translation. For each equation, write down the column vector that describes the translation from y = f(x) to y = g(x).

(a) g(x) = f(x) + 6 **(1)**

.....

(b) g(x) = f(x - 4) **(1)**

.....

(c) g(x) = f(x + 2) **(1)**

.....

(d) g(x) = f(x) - 5 **(1)**

.....

(Total for Question 7 is 4 marks)

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8 A curve y = r(x) passes through the point (8, 3).

(a) After the transformation y = r(x) + c, the image of this point is (8, -5). Find the value of c. **(2)**

.....

(b) The curve y = r(kx) has an image point (2, 3) that corresponds to (8, 3) on y = r(x). Find the value of k. **(2)**

.....

(Total for Question 8 is 4 marks)

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9 The graph of y = f(x) has a minimum point at (-12, -6). Write down the coordinates of the turning point of the graph of y = f(3(x + 4)) - 5 and state whether it is a maximum or a minimum.

(Total for Question 9 is 3 marks)

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10 The point (5, -3) lies on the graph of y = f(x). Write down the coordinates of the image of this point on the graph of y = f(x + 5).

(Total for Question 10 is 2 marks)

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11 The graph of y = f(x) has a minimum point at (3, -1). Write down the coordinates of the turning point of the graph of y = -f(x + 2) - 5 and state whether it is a maximum or a minimum.

(Total for Question 11 is 3 marks)

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12 The function f is defined for whole number values of x from -3 to 3 by f(-3) = 5, f(-2) = -4, f(-1) = 1, f(0) = 3, f(1) = -4, f(2) = -2, f(3) = -7. Work out the values of y on the graph of y = f(x + 1) when x = -1, 0, 1. Give the three values in order, separated by commas.

(Total for Question 12 is 3 marks)

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13 Describe fully the single transformation that maps the graph of y = f(x) onto the graph of y = f(x) + 9.

(Total for Question 13 is 2 marks)

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14 The graph of y = f(x) has a minimum point at (15, -3). Write down the coordinates of the turning point of the graph of y = 3f(3(x + 3)) - 5 and state whether it is a maximum or a minimum.

(Total for Question 14 is 3 marks)

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15 $f(x) = x^2 - 2x - 4$. The graph of y = f(x) is transformed to give the graph of y = f(2x). Write the equation of the new graph in the form $y = ax^2 + bx + c$.

(Total for Question 15 is 3 marks)

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16 The point (-3, 0) lies on the graph of $y = f(x)$. Write down the coordinates of the image of this point on the graph of $y = f(x) + 4$.

(Total for Question 16 is 2 marks)

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17 The graph of $y = \cos(x)$ for $0 \leq x \leq 360$ has a maximum at (0, 1), a zero at (90, 0), a minimum at (180, -1), a zero at (270, 0), and a maximum at (360, 1).

(a) State the coordinates of the point on $y = \cos(x - 60)$ that corresponds to the maximum at (0, 1). **(1)**

(b) State the coordinates of the point on $y = \cos(x - 60)$ that corresponds to the minimum at (180, -1). **(1)**

(c) State the coordinates of the point on $y = \cos(x - 60)$ that corresponds to the zero at (90, 0). **(2)**

(Total for Question 17 is 4 marks)

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Mark scheme · 8.2 Transforming Graphs y=f(x): 1-hour Pack

Question 1

y = f(-x) cao **B1**

Answer: y = f(-x)

Question 2

y = -f(x + 4) cao **B1**

Answer: y = -f(x + 4)

Question 3

apply right shift by 3 and down 5: (a,b) -> (a + 3, b - 5) oe **M1**

(7, -7) cao **A1**

Answer: (7, -7)

Question 4

(a) apply reflection in y-axis: (0, 2) -> (0, 2) and then translate down 4: y -> 2 - 4 **M1**

(a) (0, -2) cao **A1**

(a) Answer: (0, -2)

(b) apply reflection in y-axis: (1, 5) -> (-1, 5) and then translate down 4: y -> 5 - 4 **M1**

(b) (-1, 1) cao **A1**

(b) Answer: (-1, 1)

Question 5

g(x) = f(-x) + 6 cao **B1**

Answer: g(x) = f(-x) + 6

Question 6

correct x mapping using -(x + 1): solve -(x' + 1) = a so x' = -a - 1 oe **M1**

correct y mapping using outer - and +5: y' = -b + 5 oe **M1**

(-4, 7) cao **A1**

Answer: (-4, 7)

Question 7

(a) (0, 6) oe **B1**

(a) Answer: (0, 6)

(b) (4, 0) oe **B1**

(b) Answer: (4, 0)

(c) (-2, 0) oe **B1**

(c) Answer: (-2, 0)

(d) (0, -5) oe **B1**

(d) Answer: (0, -5)

Question 8

(a) 3 + c = -5 oe **M1**

(a) c = -8 cao **A1**

(a) Answer: c = -8

(b) 8 / k = 2 oe **M1**

(b) k = 4 cao **A1**

(b) Answer: k = 4

Question 9

x coordinate -8 **B1**

y coordinate -11 **B1**

minimum **B1**

Answer: minimum at (-8, -11)

Question 10

x coordinate 0 **B1**

y coordinate -3 **B1**

Answer: (0, -3)

Question 11

x coordinate 1 **B1**

y coordinate -4 **B1**

maximum **B1**

Answer: maximum at (1, -4)

Question 12

first value correct **B1**

second value correct **B1**

third value correct **B1**

Answer: 3, -4, -2

Question 13

correct type of transformation **B1**

fully correct detail (vector, line or scale factor) **B1**

Answer: translation by the vector (0, 9)

Question 14

x coordinate 2 **B1**

y coordinate -14 **B1**

minimum **B1**

Answer: minimum at (2, -14)

Question 15

correct substitution into f, substitutes 2x for x **M1**

expands brackets **M1**

$y = 4x^2 - 4x - 4$ **A1**

Answer: $y = 4x^2 - 4x - 4$

Question 16

x coordinate -3 **B1**

y coordinate 4 **B1**

Answer: (-3, 4)

Question 17

(a) (60, 1) cao **B1**

(a) Answer: (60, 1)

(b) (240, -1) cao **B1**

(b) Answer: (240, -1)

(c) 90 + 60 oe **M1**

(c) (150, 0) cao **A1**

(c) Answer: (150, 0)

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