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(Total for Question 9 is 14 marks)

62- (4MB0-S 2016-Paper 2-Q4)-FUNCTIONS & GRAPHS

The equation of a curve, C , is $y = f(x)$ where $f(x) = ax^2 + b$ for all values of x , and a and b are constants.

Given that C passes through the point with coordinates $(1, -1)$

(a) write down an equation in a and b . (1)

Given also that C passes through the point with coordinates $(3, 23)$

(b) write down a second equation in a and b . (1)

(c) Solve your two equations to find the value of a and the value of b . (3)

(d) Using your values of a and b , write down the range of the function f . (2)

63- (4MB0-S 2016-Paper 2R-Q5)-FUNCTIONS & GRAPHS

The functions f , g and h are defined as

$$f: x \mapsto \frac{1+x}{x} \quad x \neq 0$$

$$g: x \mapsto \frac{2}{x} \quad x \neq 0$$

$$h: x \mapsto x + 3$$

(a) (i) Express the inverse function f^{-1} in the form $f^{-1}: x \mapsto \dots$
(ii) State the value of x which must be excluded from any domain of f^{-1} (4)

(b) Solve the equation $hg(x) = 4f^{-1}(x)$ (5)

The equation of a curve is given by $y = -2x^3 + 3x^2 + 2x$

(a) Complete the table of values for $y = -2x^3 + 3x^2 + 2x$

Give your values of y to two decimal places where necessary.

x	-1	-0.5	-0.25	0	0.25	0.5	0.75	1	1.25	1.5	2
y	3	0		0	0.66	1.5	2.34	3		3	0

(2)

(b) On the grid, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) Using your curve, write down the values, to one decimal place, of the x coordinates of the stationary points on $y = -2x^3 + 3x^2 + 2x$

(2)

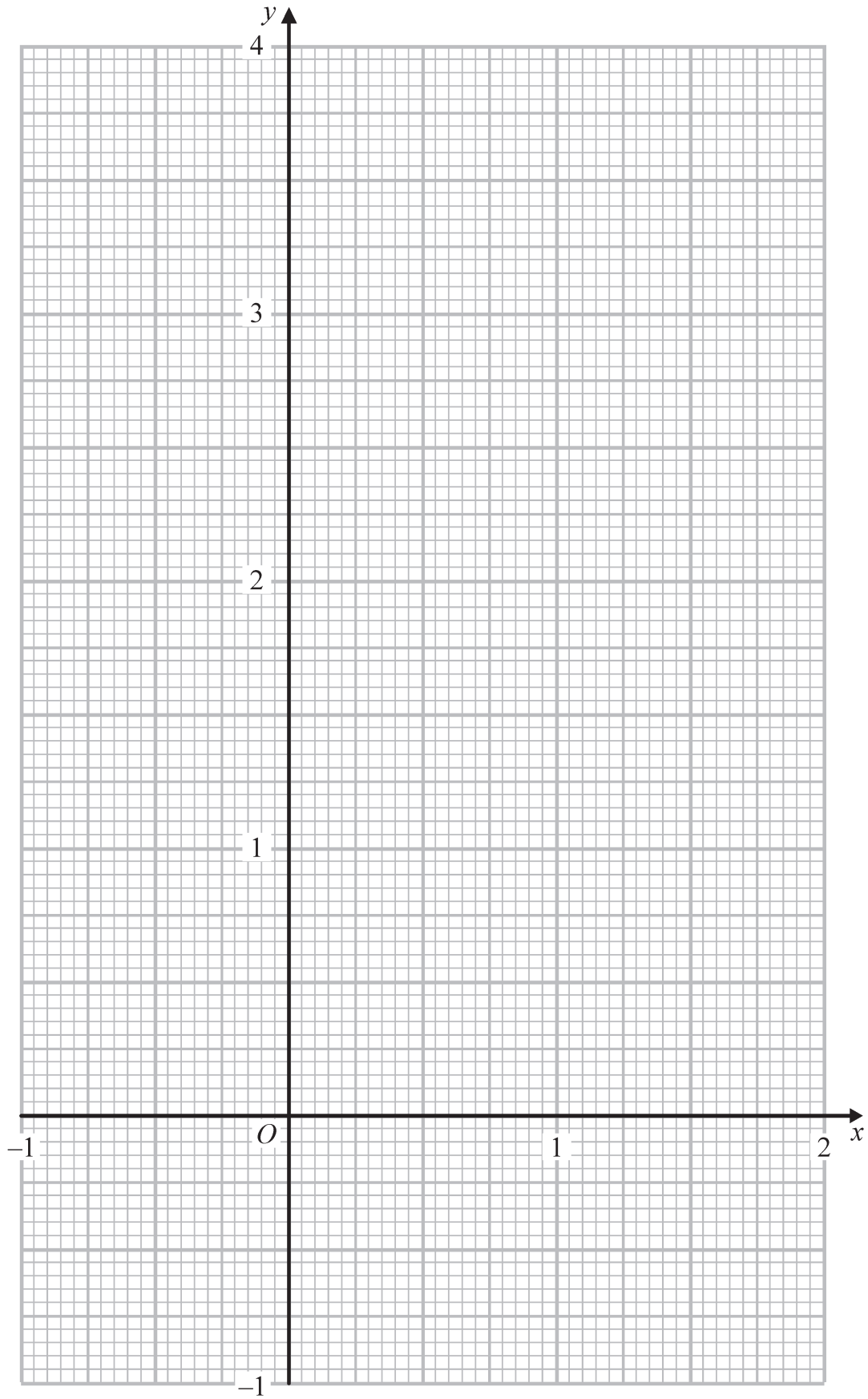
(d) Use your curve to estimate the range of values for x , to one decimal place, for which

$$-2x^3 + 3x^2 + 2x - 1 > 0$$

(3)

(e) By drawing a suitable straight line on the grid, find estimates, to one decimal place, of the 3 values of x which satisfy $-2x^3 + 3x^2 + \frac{3}{2}x - 2 = 0$

(6)



f and g are two functions such that

$$\begin{aligned} f : x \mapsto 2 - 4x \quad \text{where } x < 1 \\ g : x \mapsto 7 - x^2 \quad \text{where } x \leq 0 \end{aligned}$$

(a) Write down the range of

(i) f

(ii) g

(2)

(b) Express the inverse function f^{-1} in the form $f^{-1} : x \mapsto \dots$

(2)

(c) Find the value of x for which $3f(x) = 4g(x)$.
Give your answer to 3 significant figures.

(5)

$$\left[\text{Solutions of } ax^2 + bx + c = 0 \text{ are } x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a} \right]$$

