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AQA, Edexcel, OCR, MEI

A Level

A Level Mathematics

C1 Algebra (Answers)

Name:

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Total Marks: /49

C1 - Algebra (Answers)
MEI, OCR, AQA, Edexcel

1. Let n and m be two numbers. Complete the statements below by writing the correct symbol ($\Rightarrow$, $\Leftarrow$, or $\Leftrightarrow$) onto the dotted lines below.

   (a) $\Leftrightarrow$. [1]

   (b) $\Leftarrow$.
   (The arrow is only one way because $\Rightarrow$ does not hold for negative numbers smaller than -2). [1]

2. True. [1]

3. $x = 3$. [1]

4. $x = 1$ or $x = -2$. [2]

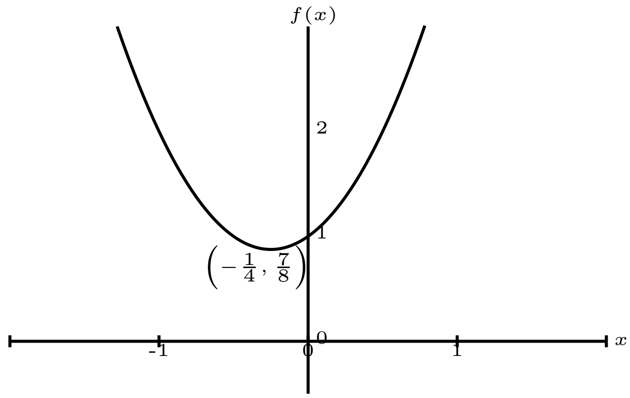
5. $y = \sqrt{\frac{1}{x-2}}$
   $y^2 = \frac{1}{x-2}$
   $x - 2 = \frac{1}{y^2}$
   $x = \frac{1}{y^2} + 2$. [2]

6. Consider the quadratic function $f(x) = 2x^2 + x + 1$.

   (a) The discriminant is the quantity $b^2 - 4ac$ in the quadratic formula.
   $b^2 - 4ac = -7$.
   The discriminant is less than 0. This means that the equation has no real solutions. It also means that the graph of $f(x)$ does NOT intersect the x axis. [3]

   (b) $2x^2 + x + 1$
   $2\left(x^2 + \frac{1}{2}x\right) + 1$
   $2\left(\left(x + \frac{1}{4}\right)^2 - \frac{1}{16}\right) + 1$
   $2\left(x + \frac{1}{4}\right)^2 + \frac{7}{8}$
   Hence the minimum point of $f(x)$ is $\left(-\frac{1}{4}, \frac{7}{8}\right)$. [3]

(c) [2]



7. Let $g(x) = x^2 - 4x + 3$ and $h(x) = 2x - 2$.

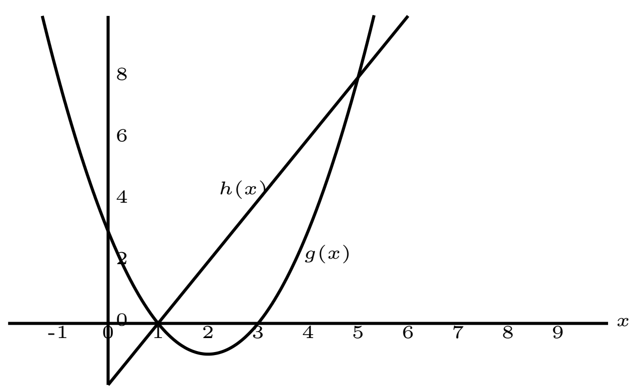
(a) $x^2 - 4x + 3 = 2x - 2$

$x^2 - 6x + 5 = 0$
$(x-1)(x-5) = 0$
Hence $x = 1$ or $x = 5$
Substituting these values into either function gives the coordinates $(1, 0)$ and $(5, 8)$. [3]

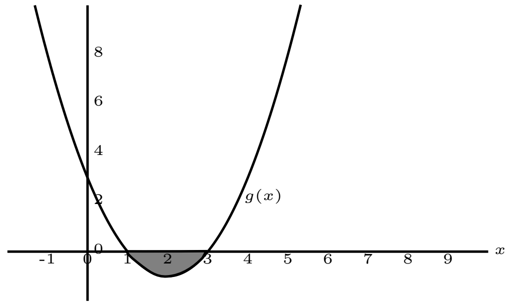
(b) $g(x) = x^2 - 4x + 3$

$= (x-2)^2 - 4 + 3$
$= (x-2)^2 - 1$
Hence the minimum point of $g(x)$ is $(2, -1)$. [3]

(c) [2]



8. From the plot of $g(x)$, we see immediately that the function is less than (or equal to) 0 when $1 \leq x \leq 3$. [2]



9. $x > -5$. [2]

10. $\sqrt{3}$. *(multiply the top and bottom of the fraction by* $\sqrt{3}$ *and simplify)* [2]

11. $\frac{1}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1}$.
$= \frac{\sqrt{2}-1}{(\sqrt{2}+1)(\sqrt{2}-1)}$
$= \sqrt{2} - 1$. [2]

12. $\frac{1}{16}$. [2]

13. $\frac{c}{2b}$. [3]

14. $3^{-2} = \left(\frac{1}{3}\right)^2$.
$= \frac{1}{9}$ [1]

15. 1. *(Any number to the power* 0 *is* 1*)* [1]

16. 6. [3]

17. Consider the function $f(x)$ plotted below You are given that $f(x)$ is a quadratic function of the form $f(x) = x^2 + ax + b$.

    (a) Use points $(0, 0)$ and $(3, 0)$.
    $f(0) = 0$ so we have that $b = 0$.
    $f(3) = 0$ thus $0 = 3^2 + 3a$
    rearranging gives $a = -3$. [4]

    (b) $f(x) = x^2 - 3x$.
    $= (x - 1.5)^2 - 2.25$
    Hence $f(x)$ has a line of symmetry at $x = 1.5$. [3]