Level 2 Further Maths

Quadratic Graphs

Corbettmaths

Ensure you have: Pencil or pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

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1. Sketch the graph of \( y = x^2 + 6x + 8 \)
   Clearly show the coordinates of any points of intersection with the axes.
   
   \[
   (x + 2)(x + 4) \quad x = 0, 0^2 + 0 + 8
   \]
   \[
   x = -2, x = -4
   \]
   \[
   (-2, 0) \quad (-4, 0)
   \]

   ![Graph](image1)

2. Sketch the graph of \( y = x^2 - x - 56 \)
   Clearly show the coordinates of any points of intersection with the axes.
   
   \[
   (x - 8)(x + 7) \quad x = 8, x = -7
   \]
   \[
   (8, 0) \quad (-7, 0)
   \]

   ![Graph](image2)
3. (a) Sketch the graph of \( y = x^2 - 38x + 72 \)
Clearly show the coordinates of any points of intersection with the axes.

\[
\begin{align*}
(x-3\{})(x-2) \\
x = 3 & \quad x = 2 \\
(3, 0) & \quad (2, 0) \\
(0, 72) & \quad (0, 72)
\end{align*}
\]

(b) Work out the equation of the line of symmetry of the graph of
\( y = x^2 - 38x + 72 \)

\( x = 19 \)
4. (a) Sketch the graph of \( y = x^2 - 4x - 5 \)
Clearly show the coordinates of any points of intersection with the axes.
\[
(x - 5)(x + 1) \quad  \quad  (0, -5)
\]
\[
(5, 0) \quad  (-1, 0)
\]

(b) Work out the equation of the line of symmetry of the graph of
\( y = x^2 - 4x - 5 \)
\[
\chi = 2
\]

(c) Use your answer to (b) to find the coordinates of the minimum point of
\( y = x^2 - 4x - 5 \)
\[
y = 2^2 - 4 \times 2 - 5
\]
\[
y = -9
\]
\[
(2, -9)
\]

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5. Sketch the graph of \( y = -x^2 + 6x + 55 \)
Clearly show the coordinates of any points of intersection with the axes.
\[
\begin{align*}
\frac{x^2}{-6} + \frac{y}{-55} &= 1\left(\frac{x}{-11}\right)\left(\frac{y}{5}\right) \\
x &= 11 \\
y &= -5
\end{align*}
\]
(3)

6. Sketch the graph of \( y = 5x^2 - 31x + 30 \)
Clearly show the coordinates of any points of intersection with the axes.
\[
\begin{align*}
\left(\frac{5x}{-1}\right)\left(\frac{x}{-6}\right) &= 1 \\
x &= \frac{1}{6} \\
2 &= b
\end{align*}
\]
(4)
7. Sketch the graph of \( y = 2x^2 + 7x - 4 \)
   Clearly show the coordinates of any points of intersection with the axes.
   \[
   \begin{align*}
   (2x - 1)(x + 4) & \quad x = \frac{1}{2} \quad x = -4 \\
   (\frac{1}{2}, 0) & \quad (-4, 0) \\
   (0, 4) & \\
   (-4, 0) & \quad (\frac{1}{2}, 0)
   \end{align*}
   \]

(b) Work out the equation of the line of symmetry of the graph of
   \( y = 2x^2 + 7x - 4 \)
   \[
   \frac{-4 + 0.5}{2} = -1.75
   \]

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8. Shown is the graph of \( y = x^2 + bx + c \)

(a) Find the values of \( b \) and \( c \)

\[ y = (x - 3)(x - 8) \]
\[ y = x^2 - 11x + 24 \]

\[ b = -11 \quad c = 24 \]

(b) Find the coordinates of point A

\( (0, 24) \)
9. Shown is the graph of \( y = x^2 + ax + b \)

\[ (x + 12)(x + 5) = x^2 + 17x + 60 \]

\( a = 17 \)

\( b = 60 \)

(a) Find the values of \( a \) and \( b \)

(b) Find the coordinates of point \( c \)

\((-5, 0)\)
11. Shown below is the graph of \( y = 2x^2 - 4x + 1 \)

The graph of \( 2x^2 - 4x + 1 = k \) has exactly one solution.

Use the graph to find the value of \( k \)

\[
\text{\( k = -1 \)}
\]

(2)
12. Shown below is \( y = x^2 - x - 2 \)

By drawing an appropriate straight line, use your graph to find estimates for the solutions of \( x^2 - 2x - 1 = 0 \)

\[
\begin{align*}
  y &= x^2 - x - 2 \\
  0 &= x^2 - 2x - 1 \\
  y &= x - 1
\end{align*}
\]

\[ x = -0.4 \text{ or } x = 2.4 \]
13. Shown below is $y = 2x^2 - x - 2$

By drawing an appropriate straight line, use your graph to find estimates for the solutions of $2x^2 - 4x - 3 = 0$

$$y = 2x^2 - x - 2$$

$$0 = 2x^2 - 4x - 3$$

$$y = 3x + 1$$

$x = 0.6$ or $x = 2.55$

(4)
14. Here is the graph of $y = a + bx - 3x^2$

Work out the coordinates of the point A.

CURVE 1

$y = (x + 2)(3x - 4)$

$y = 3x^2 - 4x + 6x - 6$

$y = 3x^2 + 2x - 6$

CURVE 2

$y = -3x^2 - 2x + 6$

$y = 6 - 2x - 3x^2$

$\alpha = 8$

$\beta = -2$

(4)