
Quadratics - Past Edexcel Exam Questions

1. (Question 3 - May 2018)

$$f(x) = x^2 - 10x + 23$$

(a) Express $f(x)$ in the form $(x + a)^2 + b$ where a and b are constants to be found. [2]

(b) Hence, or otherwise, find the exact solutions to the equation [2]

$$x^2 - 10x + 23 = 0.$$

(c) Use your answer to part (b) to find the larger solution to the equation

$$y - 10y^{0.5} + 23 = 0.$$

Write your solution in the form $p + q\sqrt{r}$, where p , q and r are integers. [2]

2. (Question 5 - May 2017)

$$f(x) = x^2 - 8x + 19$$

(a) Express $f(x)$ in the form $(x + a)^2 + b$ where a and b are constants. [2]

The curve C with equation $y = f(x)$ crosses the y -axis at the point P and has a minimum point at the point Q .

(b) Sketch the graph of C showing the coordinates of point P and the coordinates of point Q . [3]

(c) Find the distance PQ , writing your answer as a simplified surd. [3]

3. (Question 11 - May 2014)

Given that

$$f(x) = 2x^2 + 8x + 3$$

(a) find the value of the discriminant of $f(x)$. [2]

- (b) Express $f(x)$ in the form $p(x + q)^2 + r$, where p , q and r are integers to be found. [3]

The line $y = 4x + c$, where c is a constant, is a tangent to the curve with equation $y = f(x)$.

- (c) Calculate the value of c . [5]

4. (Question 10 - Jan 2013)

$$4x^2 + 8x + 3 \equiv a(x + b)^2 + c$$

- (a) Find the values of the constants a , b and c . [3]
 (b) Sketch the curve with equation $y = 4x^2 + 8x + 3$, showing clearly the coordinates of any points where the curve crosses the coordinate axes. [4]

5. (Question 8 - May 2012)

$$4x - 5 - x^2 = q - (x + p)^2,$$

where p and q are integers.

- (a) Find the value of p and the value of q . [3]
 (b) Calculate the discriminant of $4x - 5 - x^2$. [2]
 (c) Sketch the curve with equation $y = 4x - 5 - x^2$, showing clearly the coordinates of any points where the curve crosses the coordinate axes. [3]

6. (Question 5 - Jan 2012)

The curve C has equation $y = x(5 - x)$ and the line L has equation $2y = 5x + 4$.

- (a) Use algebra to show that C and L do not intersect. [4]
 (b) Sketch C and L on the same diagram, showing the coordinates of the points at which C and L meet the axes. [4]

7. (Question 4 - May 2010)

(a) Show that $x^2 + 6x + 11$ can be written as

$$(x + p)^2 + q$$

where p and q are integers to be found. [2]

(b) Sketch the curve with equation $y = x^2 + 6x + 11$, showing clearly any intersections with the coordinate axes. [2]

(c) Find the value of the discriminant of $x^2 + 6x + 11$. [2]

8. (Question 10 - Jan 2010)

$$f(x) = x^2 + 4kx + (3 + 11k), \quad \text{where } k \text{ is a constant.}$$

(a) Express $f(x)$ in the form $(x + p)^2 + q$, where p and q are constants to be found in terms of k . [3]

Given that the equation $f(x) = 0$ has no real roots,

(b) find the set of possible values of k . [4]

Given that $k = 1$,

(c) sketch the graph of $y = f(x)$, showing the coordinates of any point at which the graph crosses a coordinate axis. [3]

9. (Question 3 - May 2006)

On separate diagrams, sketch the graphs of

(a) $y = (x + 3)^2$, [3]

(b) $y = (x + 3)^3 + k$, where k is a positive constant. [2]

Show on each sketch the coordinates of each point at which the graph meets the axes.

10. (Question 10 - Jan 2006)

$$x^2 + 2x + 3 \equiv (x + a)^2 + b.$$

- (a) Find the value of the constants a and b . [2]
- (b) Sketch the graph of $y = x^2 + 2x + 3$, indicating clearly the coordinates of any intersections with the coordinate axes. [3]
- (c) Find the value of the discriminant of $x^2 + 2x + 3$. Explain how the sign of the discriminant relates to your sketch in part (b). [2]

The equation $x^2 + kx + 3 = 0$, where k is a constant, has no real roots.

- (d) Find the set of possible values of k , giving your answer in surd form. [4]
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11. (Question 3 - May 2005)

$$x^2 - 8x - 29 \equiv (x + a)^2 + b,$$

where a and b are constants.

- (a) Find the value of a and the value of b . [3]
- (b) Hence, or otherwise, show that the roots of

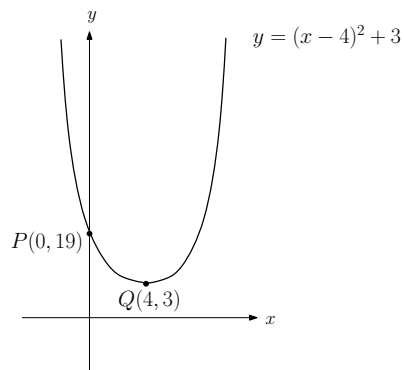
$$x^2 - 8x - 29 = 0$$

are $c \pm d\sqrt{5}$, where c and d are integers to be found. [3]

Solutions

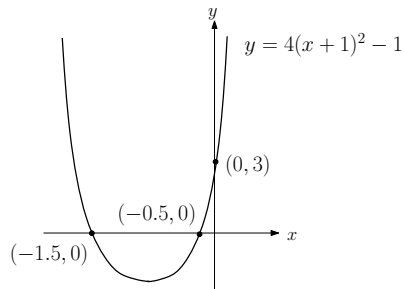
1. (a) $(x - 5)^2$, $a = -5$, $b = -2$
 (b) $x = 5 \pm \sqrt{2}$
 (c) $y = 27 \pm 10\sqrt{2}$, $p = 27$, $q = 10$, $r = 2$

2. (a) $(x - 4)^2 + 3$, $a = -4$, $b = 3$
 (b) See graph below.



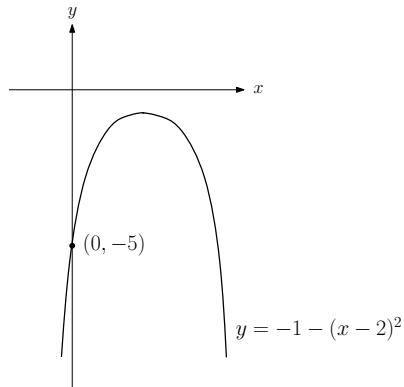
- (c) $4\sqrt{17}$
3. (a) 40
 (b) $f(x) = 2(x + 2)^2 - 5$. $p = 2$, $q = 2$, $r = -5$
 (c) $c = 1$ (*Differentiation example*)

4. (a) $a = 4$, $b = 1$, $c = -1$
 (b) See graph below.



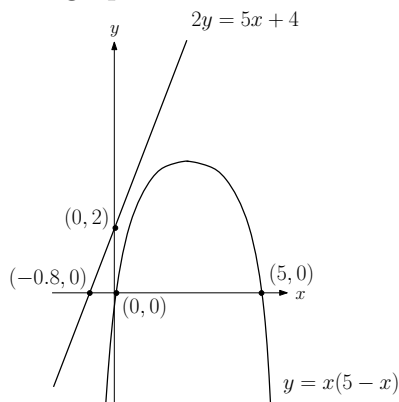
5. (a) $p = -2$, $q = -1$
 (b) -4

(c) See graph below.



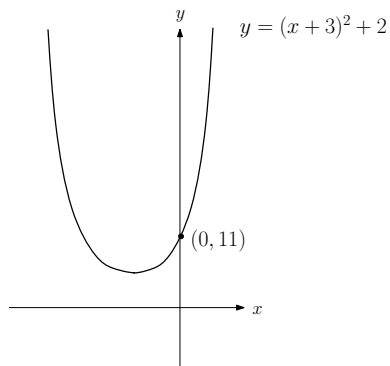
6. (a) $x(5 - x) = \frac{5x+4}{2}$ rearranged into a quadratic has no real solutions.

(b) See graph below.



7. (a) $p = 3, q = 2$

(b) See graph below.

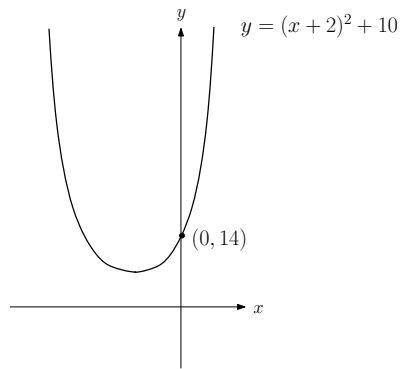


(c) -8

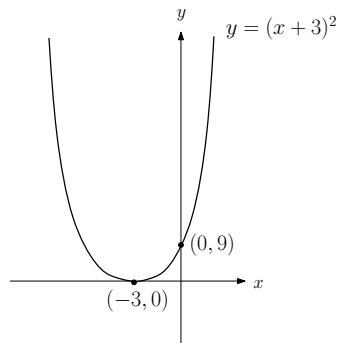
8. (a) $p = 2k, q = 3 + 11k - 4k^2$

(b) $-\frac{1}{4} < k < 3$ (*Discriminant example*)

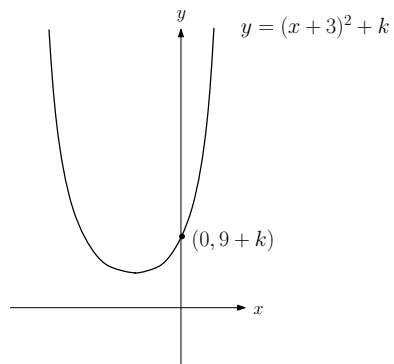
(c) See graph below.



9. (a) See graph below.

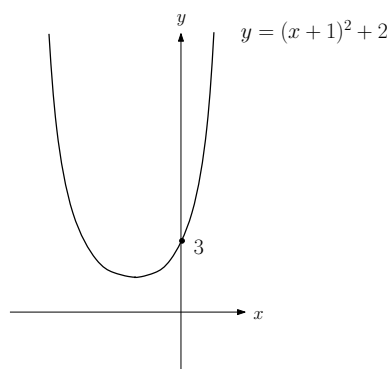


(b) See graph below.



10. (a) $a = 1, b = 2$

(b) See graph below.



- (c) $-8 < 0$, no roots
 - (d) $-2\sqrt{3} < k < 2\sqrt{3}$ (*Discriminant example*)
11. (a) $a = -4$, $b = -45$
- (b) $c = 4$, $d = 3$