Chapter 3 Quadratics: **Assignment**

1 Sketch the graphs of each of the following:

a $y = -x^2 + 8$ **b** $y = (x - 3)^2 - 5$

c $y = 5 - (x + 3)^2$ **d** $y = x^2 - x - 8$

2 Use the quadratic formula to solve each of the following:

a $x^2 - 6x - 2 = 0$ **b** $2x^2 - 3x - 7 = 0$

3 A rectangle has a perimeter of 80 m and the square of the length of the diagonal is 1000. Find its dimensions.

4 A parabola that has its vertex at the point with coordinates (–1, 6) passes through the point (2, 10). Find the equation of the parabola.

5 Solve the simultaneous equations for x and y:

$y = x^2 + 7x - 11$

$y = x - 1$

6 A lawn a metres long and b metres wide has a path of uniform width x metres around it.

a Find the area of the path in terms of a, b and x.

b **i** If $a = 28$ and $b = 50$ find the area of the path in terms of x.

ii If the area of the path is 160 m^2 find the value of x.

7 Consider the quadratic equation $2px^2 + 6x + 2 = 0$.

a Find the discriminant.

b Find the values of p for which there are two solutions.

c Find the values of p for which there are no solutions.

d Find the value of p for which there is one solution.

8 Using the discriminant, show that the graph of $y = 2x^2 + 6px - 2$ touches or crosses the x-axis for all values of p.

9 Consider the quadratic equation $(-2p + 1)x^2 + (p - 2)x + 6p = 0$.

a Find the discriminant.

b Show that the discriminant is a perfect square.

c For $p \neq \frac{1}{2}$, show that there are always two rational solutions and find these solutions.

10 Consider the quadratic equation $ax^2 + 10x + (a - 5) = 0$.

a Find the discriminant.

b Find the values of a for which there are two solutions.

c Find the values of a for which there are no solutions.

d Find the value of a for which there is one solution.

11 Consider the quadratic rule $a^2x^2 - 2ax - a + 1$.

a Find the discriminant.

b Find the values of a for which the graph $y = a^2x^2 - 2ax - a + 1$:

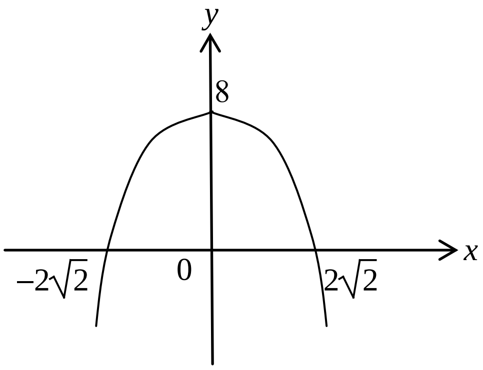
i crosses the x-axis

ii does not cross the x-axis.

c Show that $a^2x^2 - 2ax - a + 1 = (ax + \sqrt{a} - 1)(ax - \sqrt{a} - 1)$.

Answers

1 **a**



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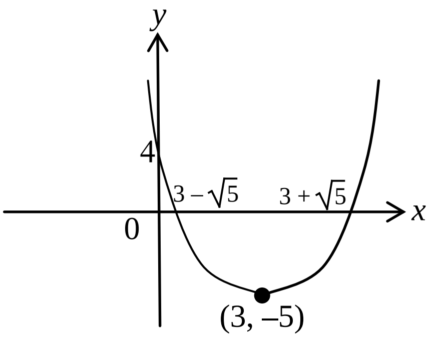

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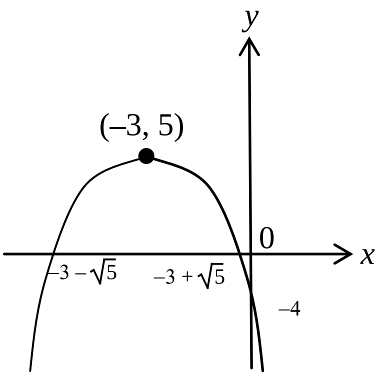

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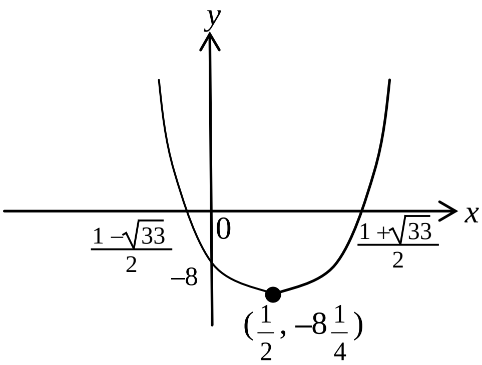

2 **a** $3 - \sqrt{11}$ or $3 + \sqrt{11}$

b $\frac{3 + \sqrt{65}}{4}$ or $\frac{3 - \sqrt{65}}{4}$

3 30 m by 10 m

4 $y = \frac{4}{9}(x + 1)^2 + 6$

5 $(-3 - \sqrt{19}, -4 - \sqrt{19}), (-3 + \sqrt{19}, -4 + \sqrt{19})$

6 **a** $A = 4x^2 + 2xb + 2xa$

b **i** $A = 4x^2 + 156x$ **ii** $x = 1$

7 **a** $36 - 16p$ **b** $p < \frac{9}{4}$

c $p > \frac{9}{4}$ **d** $p = \frac{9}{4}$

8 $36p^2 + 16 > 0$ for all p

9 **a** $49p^2 - 28p + 4$

b $(7p - 2)^2$

c 2 and $\frac{3p}{1 - 2p}$

10 **a** $-4a^2 + 20a + 100$

b $\frac{5 - 5\sqrt{5}}{2} < a < \frac{5 + 5\sqrt{5}}{2}$

c $a > \frac{5 + 5\sqrt{5}}{2}$ or $a < \frac{5 - 5\sqrt{5}}{2}$

d $\frac{5 + 5\sqrt{5}}{2}$ or $\frac{5 - 5\sqrt{5}}{2}$

11 **a** $4a^3$

b **i** $a > 0$ **ii** $a < 0$