CHAPTER 2: QUADRATIC EQUATIONS

Paper 1

Solution to Question 21

(a) $px(x + 3) = 3(x - 1)$

$px^2 + 3px = 3x - 3$

$px^2 + (3p - 3)x + 3 = 0$

Sum of roots:

$$\frac{1}{p} + q = \frac{1 + pq}{p} = \frac{-(3p - 3)}{p}$$

$1 + pq = -3p + 3$

$pq + 3p = 2$

Product of roots:

$$\frac{1}{p} \times q = \frac{q}{p} = \frac{3}{p}$$

$q = 3$

Substitute $q = 3$ into $pq + 3p = 2$.

$3p + 3p = 2$

$6p = 2$

$$p = \frac{1}{3}$$

(b) When $p = \frac{1}{3}$, $3p = 1$

When $q = 3$, $-2q = -6$

The roots are 1 and −6.

Sum of roots = $1 + (-6) = -5$

Product of roots = $1(-6) = -6$

Thus, the equation is

$x^2 - (-5)x + (-6) = 0$

$x^2 + 5x - 6 = 0$

Paper 1

1. The quadratic equation $x^2 + px + 25 = 3x$ has two equal roots. Find the possible values of p.

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2. Given the roots of the quadratic equation $x^2 + (k - 2)x + 25 = 0$ are equal. Find the possible values of k.

3. Determine the roots of the quadratic equation $x^2 + 4x - 2 = 0$ by completing the square. Give the answer correct to four significant figures.

4. If the quadratic equation $x^2 + 3x = k$ has real and distinct roots, show that $k \geq -\frac{9}{4}$. For the case when $k = 4$, find the roots of the equation.

5. Given 4 is one of the roots of the quadratic equation $2x^2 + x = p$, where p is a constant.
(a) Find the value of p.
(b) Hence, find the other root of the equation.

6. Show that the straight line $y = 4x + 3$ touches the curve $y = x^2 + 2x + 4$ at only one point. Hence, find the coordinates of the point.