EXERCISE 4.3

1. Find the roots of the quadratic equations by using the quadratic formula in each of the following:

(i) $2x^2 - 3x - 5 = 0$
(ii) $5x^2 + 13x + 8 = 0$
(iii) $-3x^2 + 5x + 12 = 0$
(iv) $-x^2 + 7x - 10 = 0$
(v) $x^2 + 2\sqrt{2}x - 6 = 0$
(vi) $x^2 - 3\sqrt{5}x + 10 = 0$
(vii) $(\frac{1}{2})x^2 - \sqrt{11}x + 1 = 0$

Solution:

The quadratic formula for finding the roots of quadratic equation $ax^2 + bx + c = 0, a \neq 0$ is given by,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(i) $2x^2 - 3x - 5 = 0$

$$\therefore x = \frac{-(-3) \pm \sqrt{3^2 - 4(2)(-5)}}{2(2)}$$
$$= \frac{3 \pm \sqrt{49}}{4}$$
$$= \frac{3 \pm 7}{4} = \frac{5}{2}, -1$$

(ii) $5x^2 + 13x + 8 = 0$

$$\therefore x = \frac{-13 \pm \sqrt{(-13)^2 - 4(5)(8)}}{2(5)}$$
$$= \frac{-13 \pm \sqrt{9}}{10}$$
$$= \frac{-13 \pm 3}{10} = -1, -\frac{8}{5}$$

(iii) $-3x^2 + 5x + 12 = 0$

$$\therefore x = \frac{-5 \pm \sqrt{5^2 - 4(-3)(12)}}{2(-3)}$$
$$= \frac{-5 \pm \sqrt{169}}{-6}$$
$$= \frac{5 \pm 13}{6} = 3, -\frac{4}{3}$$

(iv) $-x^2 + 7x - 10 = 0$

$$\therefore\ x = \frac{-7 \pm \sqrt{(-7)^2 - 4(-1)(-10)}}{2(-1)}$$
$$= \frac{-7 \pm \sqrt{9}}{-2}$$
$$= \frac{7 \pm 3}{2} = \mathbf{5, 2}$$

(v) $x^2 + 2\sqrt{2}x - 6 = 0$

$$\therefore\ x = \frac{-2\sqrt{2} \pm \sqrt{\left(2\sqrt{2}\right)^2 - 4(1)(-6)}}{2(1)}$$
$$= \frac{-2\sqrt{2} \pm \sqrt{32}}{2}$$
$$= \frac{-2\sqrt{2} \pm 4\sqrt{2}}{2} = \mathbf{\sqrt{2}, -3\sqrt{2}}$$

(vi) $x^2 - 3\sqrt{5}x + 10 = 0$

$$\therefore\ x = \frac{-(-3\sqrt{5}) \pm \sqrt{\left(-3\sqrt{5}\right)^2 - 4(1)(10)}}{2(1)}$$
$$= \frac{3\sqrt{5} \pm \sqrt{5}}{2} = \mathbf{2\sqrt{5}, \sqrt{5}}$$

(vii) $(\frac{1}{2})x^2 - \sqrt{11}x + 1 = 0$

$$\therefore\ x = \frac{-(-\sqrt{11}) \pm \sqrt{\left(-\sqrt{11}\right)^2 - 4\left(\frac{1}{2}\right)(1)}}{2\left(\frac{1}{2}\right)}$$
$$= \frac{\sqrt{11} \pm \sqrt{9}}{1}$$
$$= \sqrt{11} \pm 3 = \mathbf{3 + \sqrt{11}, -3 + \sqrt{11}}$$

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