



Quadratic Equations Ex 8.5 Q2

Answer :

In the following parts we have to find the real roots of the equations

(i) We have been given,

$$16x^2 = 24x + 1$$

$$16x^2 - 24x - 1 = 0$$

Now we also know that for an equation $ax^2 + bx + c = 0$, the discriminant is given by the following equation:

$$D = b^2 - 4ac$$

Now, according to the equation given to us, we have, $a = 16$, $b = -24$ and $c = -1$.

Therefore, the discriminant is given as,

$$\begin{aligned} D &= (-24)^2 - 4(16)(-1) \\ &= 576 + 64 \\ &= 640 \end{aligned}$$

Since, in order for a quadratic equation to have real roots, $D \geq 0$. Here we find that the equation satisfies this condition, hence it has real roots.

Now, the roots of an equation is given by the following equation,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$\begin{aligned} x &= \frac{-(-24) \pm \sqrt{640}}{2(16)} \\ &= \frac{24 \pm 8\sqrt{10}}{32} \\ &= \frac{3 \pm \sqrt{10}}{4} \end{aligned}$$

Now we solve both cases for the two values of x . So, we have,

$$x = \frac{3 + \sqrt{10}}{4}$$

Also,

$$x = \frac{3 - \sqrt{10}}{4}$$

Therefore, the roots of the equation are $\boxed{\frac{3 + \sqrt{10}}{4}}$ and $\boxed{\frac{3 - \sqrt{10}}{4}}$

(ii) We have been given, $x^2 + x + 2 = 0$

Now we also know that for an equation $ax^2 + bx + c = 0$, the discriminant is given by the following equation:

$$D = b^2 - 4ac$$

Now, according to the equation given to us, we have, $a = 1$, $b = 1$ and $c = 2$.

Therefore, the discriminant is given as,

$$\begin{aligned} D &= (1)^2 - 4(1)(2) \\ &= 1 - 8 \\ &= -7 \end{aligned}$$

Since, in order for a quadratic equation to have real roots, $D \geq 0$. Here we find that the equation does not satisfy this condition, hence it does not have real roots.

(iii) We have been given, $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$

Now we also know that for an equation $ax^2 + bx + c = 0$, the discriminant is given by the following equation:

$$D = b^2 - 4ac$$

Now, according to the equation given to us, we have, $a = \sqrt{3}$, $b = 10$ and $c = -8\sqrt{3}$.

Therefore, the discriminant is given as,

$$\begin{aligned} D &= (10)^2 - 4(\sqrt{3})(-8\sqrt{3}) \\ &= 100 + 96 \\ &= 196 \end{aligned}$$

Since, in order for a quadratic equation to have real roots, $D \geq 0$. Here we find that the equation satisfies this condition, hence it has real roots.

Now, the roots of an equation are given by the following equation,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$\begin{aligned} x &= \frac{-(10) \pm \sqrt{196}}{2(\sqrt{3})} \\ &= \frac{-10 \pm 14}{2\sqrt{3}} \\ &= \frac{-5 \pm 7}{\sqrt{3}} \end{aligned}$$

Now we solve both cases for the two values of x . So, we have,

$$\begin{aligned} x &= \frac{-5 + 7}{\sqrt{3}} \\ &= \frac{2}{\sqrt{3}} \end{aligned}$$

Also,

$$\begin{aligned} x &= \frac{-5 - 7}{\sqrt{3}} \\ &= -4\sqrt{3} \end{aligned}$$

Therefore, the roots of the equation are $\boxed{\frac{2}{\sqrt{3}}}$ and $\boxed{-4\sqrt{3}}$.

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