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,

$$D = (-24)^2 - 4(16)(-1)$$
$$= 576 + 64$$
$$= 640$$

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,

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

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 satisfies 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,

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

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 is given by the following equation,

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

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

$$\begin{aligned}x&=\frac{-(10)\pm\sqrt{196}}{2\left(\sqrt{3}\right)}\\&=\frac{-10\pm14}{2\sqrt{3}}\\&=\frac{-5\pm7}{\sqrt{3}}\end{aligned}$$

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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