Pakistan School
Kingdom of Bahrain

WELCOME CLASS 10TH (SCIENCE)

Theory of Quadratic Equations

Objectives

Students will be able to:

Find the unknown value using discriminant

3. For what value of K the expression $k^2x^2+2(k+1)x+4$ is perfect square.

Solution:

$k^2x^2+2(k+1)x+4=0$

Compare it with

$ax^2+bx+c=0$

Here $a=k^2,\ b=2(k+1),\ c=4$

Disc. $=b^2-4ac$

$=\left[2(k+1)\right]^2-4(k^2)(4)$

$=4(k+1)^2-16k^2$

$=4(k^2+2k+1)-16k^2$

$=4k^2+8k+4-16k^2$

$=-12k^2+8k+4$

As the disc. of the given expression is a perfect square.

Thereor the roots are rational and equal.

So, Disc=0

$-12k^2+8k+4=0$

$\Rightarrow \quad 12k^2-8k-4=0$

$12k^2-12k+4k-4=0$

$12k(k-1)+4(k-1)=0$

$(12k+4)(k-1)=0$

Either $12k+4=0$ *or* $k-1=0$

$12k=-4 \qquad k=1$

$k=\frac{-4}{12}$

$k=\frac{-1}{3}$

4. Find the value of k, if the roots of the following equations are equal.

$(i)\ \ (2k+1)x^2+3kx+3=0$

Solution:

$(2k+1)x^2+3kx+3=0$

Compare it with

$ax^2+bx+c=0$

Here $a=2k+1,\ b=3k,\ c=3$

As the roots are equal, So

Disc. $=0$

$b^2-4ac=0$

$(3k)^2-4(2k+1)(3)=0$

$9k^2-12(2k+1)=0$

$9k^2-24k+12=0$

$3(3k^2-8k+4)=0$

$\Rightarrow 3k^2-8k+4=0$

$3k^2-6k-2k+4=0$

$3k(k-2)-2(k-2)=0$

$(3k-2)(k-2)=0$

Either $3k-2=0$ *or* $k-2=0$

$3k=2$ $\qquad$ $k=2$

$k=\frac{2}{3}$

5. Show that the equation $x^2+(mx+c)^2=a^2$ has equal roots,

if $c^2=a^2(1+m^2)$

Solution:

$x^2+(mx+c)^2=a^2$

$x^2+m^2x^2+2mcx+c^2=a^2$

$(1+m^2)x^2+2mcx+c^2=a^2$

$(1+m^2)x^2+2mcx+c^2-a^2=0$

Here $a=1+m^2,\ b=2mc,\ c=c^2-a^2$

As the roots are equal, So

$Disc.=0$

$b^2-4ac=0$

$(2mc)^2-4(1+m^2)(c^2-a^2)=0$

$4m^2c^2-4(c^2-a^2+m^2c^2-a^2m^2)=0$

$4m^2c^2-4c^2+4a^2-4m^2c^2+4a^2m^2=0$

$-4c^2+4a^2+4a^2m^2=0$

$-4(c^2-a^2-a^2m^2)=0$

$c^2-a^2-a^2m^2=0$

$c^2=a^2+a^2m^2$

$c^2=a^2(a+m^2)$

Hence proved.

Activity

Q. Find the value of k if the roots of the following equation are equal.

$x^2 + 2(k+2)x + (3k+4) = 0$

Solution

$x^2+2(k+2)x+(3k+4)=0$

Compare it with

$ax^2+bx+c=0$

Here $a=1,\ b=2(k+2),\ c=3k+4$

As the roots are equal, So

Disc. $=0$

$b^2-4ac=0$

$[2(k+2)]^2-4(1)(3k+4)=0$

$4(k+2)^2-4(3k+4)=0$

$4(k^2+4k+4)-12k-16=0$

$4k^2+16k+16-12k-16=0$

$4k^2+4k=0$

$4k(k+1)=0$

Either $4k=0$ *or* $k+1=0$

$k=0$ $\qquad$ $k=-1$

Homework

Ex 2.1 Remaining parts upto Q5