Q4 Find k so that the quadratic equation $x2-(k+3)x+k=0$ has equal and real roots.

Solution:

Step1 – For a quadratic $ax2+bx+c=0$ here $a=1$, $b=-(k+3)$, $c=k$.

Step 2 — Equal (repeated) real roots occur when the discriminant $\Delta=b2-4ac$ equals zero. Compute:

$\Delta=(-(k+3))2-4\cdot1\cdot k=(k+3)2-4k$.

$\Delta=k2+6k+9-4k=k2+2k+9$.

Step 3 — Solve $\Delta=0$. Set $k2+2k+9=0$. The discriminant of this quadratic in k is $22-4\cdot1\cdot9=4-36=-32<0$, so there are no real solutions for k.

Conclusion: There is no real value of k that makes the original quadratic have equal real roots. (If complex k were allowed, $k=-1\pm2i2$.)

Q.5 Form a quadratic equation with integral coefficients whose roots are $2+5$ and $2-5$.

Solution:

Step 1 — If the roots are $r1=2+5$ and $r2=2-5$, then sum $=r1+r2=(2+5)+(2-5)=4$,

product $=r1r2=(2+5)(2-5)=4-5=-1$.

Step 2 — A monic quadratic equation with these roots is

$x2-(sum)x+(product)=x2-4x-1$.Answer: quadratic equation is $x2-4x-1=0$. Its coefficients are integer.

Q.6 For roots α,β of $3x2-7x+2=0$, compute $\alpha2+\beta2$.

Solution:

Step 1 — For $ax2+bx+c=0$ we have sum= $\alpha+\beta=-ba$ and product = $\alpha\beta=ca$. Here $a=3$, $b=-7$, $c=2$, so

$\alpha+\beta=--73=73,\alpha\beta=23$.

Step 2 — By identity.

$\alpha2+\beta2=(\alpha+\beta)2-2\alpha\beta$.

Substitute the values:

$\alpha2+\beta2=(73)2-2\cdot 23=499-43$.

convert to a common denominator:

$499-129=379$.

Answer : $\alpha2+\beta2=379$.

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