Method Researchon Complex Methodof Roots

Jitendra Kumar
Department of mathematics,
HRP Degree College, Barkhera, Pilibhit (U.P.)-262203,India

Abstract: *This is a new method it is most important to solve the quadratic equation. In this method we study about, that how we can obtain the roots, angles, and distance from origin by the complex numbers.*

Keywords: *Quadratic equation, complex number, roots, angle, distance.*

1. INTRODUCTION

This method is based on the quadratic equation. In this method we solve quadratic equation by complex number. We take complex number $X \pm iY$on the place given variable such that in the quadratic equation $ax^2 + b + c = 0$. In this equation a, b, c are constant and $a \neq 0$. By this method we obtain roots, angle and distance from origin from complex number.

2. METHOD

let$ax^2 + bx + c = 0$ be a quadratic equation, where a, b, c are constant and $a \neq 0$. We take $x \to X + iY$ now we get result.

$$a(X + iY)^2 + b(X + iY) + c = 0$$

$$a(X^2 - Y^2 + 2iXY) + bX + biY + c = 0$$

$$a(X^2 - Y^2) + 2aiXY + bX + biY + c = 0$$

$$[a(X^2 - Y^2) + bX + c] + iY[2aX + b] = 0$$

Separate into real and imaginary parts.

Hence we get,

$$a(X^2 - Y^2) + bX + c = 0 \text{..................(1)}$$

$$2aX + b = 0 \text{................................(2)}$$

From equation (2) we get,

$$2aX + b = 0$$

$$2aX = -b$$

$$\boxed{X = -\frac{b}{2a}}$$

Putting the value of X in equation (1) we get

$$a\left(\frac{b^2}{4a^2} - Y^2\right) - \frac{b^2}{2a} + c = 0$$

$$\left(\frac{ab^2}{4a^2} - aY^2\right) - \frac{b^2}{2a} + c = 0$$

$$\frac{ab^2}{4a^2} - \frac{b^2}{2a} + c = aY^2$$

$$\frac{ab^2 - 2ab^2}{4a^2} + c = aY^2$$

$$\frac{-ab^2 + 4a^2c}{4a^2} = aY^2$$

$$\frac{-a(b^2 - 4ac)}{4a^2} = aY^2$$

$$Y^2 = -\frac{(b^2 - 4ac)}{4a^2}$$

$$Y^2 = \frac{(b^2 - 4ac)i^2}{4a^2} \because i^2 = -1$$

$$\boxed{Y = \pm\frac{\sqrt{(b^2 - 4ac)}}{2a}i}$$

But $x = X + iY$

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

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

$$\boxed{x = \frac{-b \mp \sqrt{(b^2 - 4ac)}}{2a}}$$

Similarly we find above relation from,$x = X - iY$

3. DISTANCE FROM ORIGEN

We know that $X = rcos\theta, Y = rsin\theta$.

Then, $r^2 = X^2 + Y^2$

$$r^2 = (-\frac{b}{2a})^2 + (\pm\frac{\sqrt{(b^2 - 4ac)}}{2a}i)^2$$

$$r^2 = \frac{b^2 - b^2 + 4ac}{4a^2}$$

$$r^2 = \frac{c}{a}$$

$$\boxed{r = \sqrt{\frac{c}{a}}}$$

4. ANGLE

We know that, $X = rcos\theta$

$$cos\theta = \frac{X}{r}$$

$$cos\theta = \frac{-b/_{2a}}{\sqrt{c/_a}}$$

$$\boxed{cos\theta = \frac{-b}{\sqrt{4ac}}}$$

5. REFERENCES

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