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Analysis of the Equations of the Form $m = \frac{i}{(1-n)^{\frac{1}{2}}}$

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Abstract: In this work, the equation of the form $m = \frac{i}{(1-n)^{\frac{1}{2}}}$ was analysed

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Let $m = \frac{i}{(1-n)^{\frac{1}{2}}}$ where i is imaginary, m and n are real (1)

Squaring $m^2(1-n) = i^2$ (2)

Replacing I by -1, $m^2(n-1) = 1$ (3)

i.e., $m^2 n = m^2 + 1$ (4)

$$\therefore \quad n = 1 + \frac{1}{m^2} \quad (4a)$$

Multiplying (3) by (n+1), $m^2(n^2 - 1) = n + 1$

i.e., $m^2 n^2 - m^2 - n - 1 = 0$ (5)

Equation (5) is quadratic in n

$$\therefore n = \frac{1 \pm [1 + 4m^4 + 4m^2]^{\frac{1}{2}}}{2m^2}$$

$$= \frac{1 \pm [(2m^2 + 1)^2]^{\frac{1}{2}}}{2m^2}$$

$$n = \frac{1 \pm 2m^2 + 1}{2m^2} \quad (6)$$

Taking positive value, $n = \frac{2 + 2m^2}{2m^2}$, i.e., $n = 1 + \frac{1}{m^2}$ (6a)

Taking negative value in (6), n = -1. (7)

According to the laws of quadratic equations the roots, $\alpha + \beta$ = - B/ A and $\alpha\beta$ = C / A.

So, $\alpha + \beta + \alpha\beta = \frac{C - B}{A}$ .Applying this relation in (5)

$$\alpha + \beta + \alpha\beta = \frac{C - B}{A} = -1$$

i.e., $\alpha + \beta + \alpha\beta + 1 = 0$

i.e., $\alpha(1 + \beta) + (1 + \beta) = 0$

i.e., $(1 + \alpha)(1 + \beta) = 0$ (7a)

i.e., $\alpha = -1$ (7b)

(7) and (7b) are one and the same result.

From (7a) we get, $(1 + \beta) = 0$

Putting (6a) in the above relation, $1 + \frac{1}{m^2} + 1 = 0$

i.e., $2m^2 + 1 = 0$

i.e., $m^2 = \frac{-1}{2}$

Taking square root on both sides, m = $\frac{i}{\sqrt{2}}$ (8)

Applying (8) in (1), $\frac{i}{\sqrt{2}} = \frac{i}{(1-n)^{\frac{1}{2}}}$

Squaring on both sides, $\frac{i^2}{2} = \frac{i^2}{1-n}$

i.e., n = -1 (9)

(7) and (9) are one and the same.

The above analysis establishes that α and β are distinct. (10)

According to the laws of quadratic equations of the general form Ax^2 + B x + C = 0,
the roots are distinct iff B^2 - 4AC = 0 (11)

Assuming (11) in (5), $1 + 4m^2 + 4m^4 = 0$

i.e., $(1 + 2m^2)^2 = 0$

I.e., $1 + 2m^2 = 0$

i.e. $m^2 = \frac{-1}{2}$

Taking square root on both sides, m = $\frac{i}{\sqrt{2}}$ (12)

Equations (8) and (12) are one and the same.

Putting (12) in (1) we have n = -1 (13)

Putting n = -1 in (5) the equation satisfies.

The above analysis shows as clear as crystal that n= -1

. is the only consistent solution for (5) (14)

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