$ax^2+bx+c = 0$, let us consider the Solution Matrix of x of this solution to be x = $\begin{bmatrix} \propto & \beta \\ -\beta & \alpha \end{bmatrix}$

- ⇨ $x^2 = x.x = \begin{bmatrix} \propto & \beta \\ -\beta & \alpha \end{bmatrix} . \begin{bmatrix} \propto & \beta \\ -\beta & \alpha \end{bmatrix} = \begin{bmatrix} \alpha^2 - \beta^2 & 2\alpha\beta \\ -2\alpha\beta & \alpha^2 - \beta^2 \end{bmatrix}$
- ⇨ $ax^2+bx+c = 0$
- ⇨ $a\begin{bmatrix} \alpha^2 - \beta^2 & 2\alpha\beta \\ -2\alpha\beta & \alpha^2 - \beta^2 \end{bmatrix} + b\begin{bmatrix} \propto & \beta \\ -\beta & \alpha \end{bmatrix} + \begin{bmatrix} c & 0 \\ 0 & c \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
- ⇨ $\begin{bmatrix} a\alpha^2 - a\beta^2 + b\alpha + c & 2\alpha\beta + b\beta \\ -2(a)\alpha\beta - b\beta & a\alpha^2 - a\beta^2 + b\alpha + c \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
- ⇨ $a(\alpha^2 - \beta^2) + b\alpha + c = 0$ &
- ⇨ $2\alpha\beta + b\beta = 0$
- ⇨ $2\beta(\alpha + b) = 0$
- ⇨ $\beta = 0$
- ⇨ $a\alpha^2 + b\alpha + c = 0$
- ⇨ $\alpha = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

x = $\begin{bmatrix} \propto & \beta \\ -\beta & \alpha \end{bmatrix}$ Solution Matrix of x of this Equation $ax^2+bx+c = 0$

- ⇨ $\alpha = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
- ⇨ $\beta = 0$
- ⇨ $x = \begin{bmatrix} \frac{-b \pm \sqrt{b^2-4ac}}{2a} & 0 \\ 0 & \frac{-b \pm \sqrt{b^2-4ac}}{2a} \end{bmatrix}$

  Let's consider $D = b^2 - 4ac$

- ⇨ $\begin{bmatrix} \frac{-b \pm \sqrt{D}}{2a} & 0 \\ 0 & \frac{-b \pm \sqrt{D}}{2a} \end{bmatrix}$
- ⇨ $b/2a \begin{bmatrix} -1 \pm \sqrt{D}/b & 0 \\ 0 & -1 \pm \sqrt{D}/b \end{bmatrix}$
- ⇨ $b/2a \left\{ \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \pm \begin{bmatrix} \sqrt{D}/b & 0 \\ 0 & \sqrt{D}/b \end{bmatrix} \right\}$
- ⇨ $b/2a \left\{ (-1) . \mathrm{I} \pm \begin{bmatrix} \sqrt{D}/b & 0 \\ 0 & \sqrt{D}/b \end{bmatrix} \right\}$
- ⇨ $- b/2a \left\{ \mathrm{I} \mp \begin{bmatrix} \sqrt{D}/b & 0 \\ 0 & \sqrt{D}/b \end{bmatrix} \right\}$

for D < 0, $\sqrt{D} = i\sqrt{D}$
So,

Most important Findings/observation -#1

it applies a phase of $\Pi/2$ from |+> state Along z axis & lands at |i+> state if D<0

Say for example for higher order of solution for $X^n = 1$ I mean to say for finding the nth root of 1 This Solution could be useful, right, cause (n - 1) Roots are imaginary. say for example for $X^5 = 1$ please do kindly note that Most of the roots, I mean to say the 4 roots of 1 are imaginary.

Example Solving:

$X^5 = 1$

- ⇨ $X^5 - 1^5 = 0$
- ⇨ $(X-1)(X^4 + X^3 + X^2 + X + 1) = 0$
- ⇨ Either X = 1
- ⇨ 0r $(X^4 + X^3 + X^2 + X + 1) = 0$
- ⇨ $X \neq 0$ so Diving by X^2
- ⇨ $(X^2 + X + 1 + 1/X + 1/X^2) = 0$
- ⇨ $(X^2 + 1/X^2 + X + 1/X + 1) = 0$
- ⇨ $\{(X+1/X)^2 + 2\, X.1/X + (X+1/X) + 1\} = 0$
- ⇨ $\{(X+1/X)^2 + 2 + (X+1/X) + 1\} = 0$
- ⇨ Let us consider $(X+1/X) = Y$
- ⇨ $Y^2 + Y + 3 = 0$
- ⇨ $Y = \frac{-1 \pm \sqrt{1^2 - 4.1.3}}{2.1}$
- ⇨ $Y = \frac{-1 \pm \sqrt{-11}}{2.1}$
- ⇨ $Y = \frac{-1 \pm i\sqrt{11}}{2.1}$
- ⇨ So, solving further this Equation for $(X+1/X) = Y$ we can find the 4 Imaginary Roots of X that is the 5^{th} Roots of 1.