Assignment 2

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Question:

If the matrix $\begin{pmatrix} 6 & -x^2 \\ 2x - 15 & 10 \end{pmatrix}$ is symmetric, then find the value of x.

Solution:

For a symmetric matrix, $\mathbf{A}^\top = \mathbf{A}$. Thus,

$$\begin{pmatrix} 6 & 2x - 15 \\ -x^2 & 10 \end{pmatrix} = \begin{pmatrix} 6 & -x^2 \\ 2x - 15 & 10 \end{pmatrix} \quad (1)$$

$\mathbf{A}^\top = \mathbf{A}$ only if each individual elements are equal. Thus,

$$2x - 15 = -x^2 \quad (2)$$
$$\implies x^2 + 2x - 15 = 0 \quad (3)$$
$$\implies x^2 + 5x - 3x - 15 = 0 \quad (4)$$
$$\implies x(x + 5) - 3(x + 5) = 0 \quad (5)$$
$$\implies (x - 3)(x + 5) = 0 \quad (6)$$
$$\implies \boxed{x = -5, 3} \quad (7)$$

Thus, the values of x for which the matrix $\begin{pmatrix} 6 & -x^2 \\ 2x - 15 & 10 \end{pmatrix}$ is symmetric, is -5 and 3.

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Output of the program used to verify whether the solution is correct:

```
[vishal@fedora code]$ python check.py
For x = -5.0, Matrix is symmetric
For x = 3.0, Matrix is symmetric
```
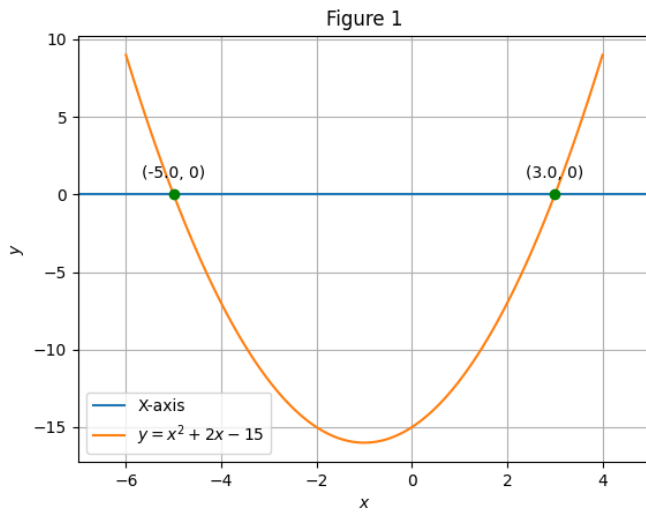
Fig. 2. Output of Program

Fig. 1. Graph of the equation $x^2 + 2x - 15 = 0$

By Fig.1, it is verifiable that roots of the Eq.3