Assignment 4

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Download all python codes from

https://github.com/BatharajuRamana/ASSIGNMNT4/Assignment6.py

and latex-tikz codes from

https://github.com/BatharajuRamana/ASSIGNMNT4/main.tex

1 Question No.2.70

In each of the following exercises,find the equation of the parabola that satisfies the following conditions:

f. vertex $\begin{pmatrix}0 & 0\end{pmatrix}$ passing through $\begin{pmatrix}5\\2\end{pmatrix}$ and symmetric with respect to the y-axis

2 solution

Given that axis is symmetric with respect to the y-axis .
So, vector equation of the parabola is,

$$\mathbf{x}^T\begin{pmatrix}1 & 0\\0 & 0\end{pmatrix}\mathbf{x}+2\begin{pmatrix}0 & -2\mathbf{a}\end{pmatrix}\mathbf{x}+0=0 \tag{2.0.1}$$

$$\mathbf{V}=\begin{pmatrix}1 & 0\\0 & 0\end{pmatrix},\mathbf{u}=\begin{pmatrix}0\\-2\mathbf{a}\end{pmatrix},f=0 \tag{2.0.2}$$

$\because |\mathbf{V}|=0$ and $\lambda_1=0$ i.e. it is in standard form

$$\mathbf{P}=\mathbf{I}\implies\mathbf{p_1}=\begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.3}$$

$$\eta=\mathbf{u}^T\mathbf{p_1}=-2\mathbf{a} \tag{2.0.4}$$

$\therefore \begin{pmatrix}5 & 2\end{pmatrix}$ satisfies it.

$$\begin{pmatrix}5 & 2\end{pmatrix}\begin{pmatrix}1 & 0\\0 & 0\end{pmatrix}\begin{pmatrix}5\\2\end{pmatrix}+2\begin{pmatrix}0 & -2\mathbf{a}\end{pmatrix}\begin{pmatrix}5\\2\end{pmatrix}=0 \tag{2.0.5}$$

$$\implies\begin{pmatrix}5 & 0\end{pmatrix}\begin{pmatrix}5\\2\end{pmatrix}+\begin{pmatrix}0 & -4\mathbf{a}\end{pmatrix}\begin{pmatrix}5\\2\end{pmatrix}=0 \tag{2.0.6}$$

$$\implies\mathbf{25}-8\mathbf{a}=0 \tag{2.0.7}$$

$$\implies\mathbf{25}=8\mathbf{a} \tag{2.0.8}$$

$$\implies\mathbf{a}=\frac{25}{8} \tag{2.0.9}$$

$\therefore$ The equation is,

$$\mathbf{x}^T\begin{pmatrix}1 & 0\\0 & 0\end{pmatrix}\mathbf{x}+2\begin{pmatrix}0 & -\frac{25}{4}\end{pmatrix}\mathbf{x}+0=0 \tag{2.0.10}$$

Plot of given parabola

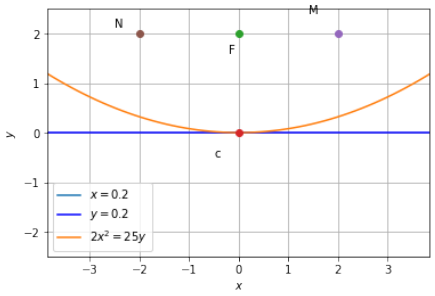

Fig. 0: Parabola $2x^2=25y$