Assignment No.7

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Download latex-tikz codes and python codes from

https://github.com/shishirNIPER/ASSIGNMENT07

Question taken from

Optimization , exercises 2.8

1 Question No 1

Find the shortest distance of the point $\begin{pmatrix}0\\c\end{pmatrix}$ from the parabola $y = x^2$, where $\frac{1}{2} \leq c \leq 5$

2 Solution

The given problem can be expressed as

$$\min_{\mathbf{x}} \|\mathbf{x} - \mathbf{P}\|^2 \tag{2.0.1}$$

$$\text{s.t. } \mathbf{x}^T\mathbf{V}\mathbf{x} + \mathbf{u}^T\mathbf{x} + d = 0 \tag{2.0.2}$$

where

$$\mathbf{V} = \begin{pmatrix}1 & 0\\0 & 0\end{pmatrix} \tag{2.0.3}$$

$$\mathbf{u} = -\begin{pmatrix}0\\1\end{pmatrix} \tag{2.0.4}$$

$$d = 0 \tag{2.0.5}$$

Let the point $\mathbf{P} = \begin{pmatrix}0\\3\end{pmatrix}$,
The following code yields the minimum distance as 1.63784147e-06 and the nearest point on the curve as

$$\mathbf{Q} = \begin{pmatrix}0\\3.00000164\end{pmatrix} \tag{2.0.6}$$

https://github.com/ShishirNIPER/ASSIGNMENT07/blob/main/Minimum_dist.ipynb

The following code plots below Fig 2.1

https://github.com/shishirNIPER/ASSIGNMENT07/blob/main/parabola_plot.ipynb

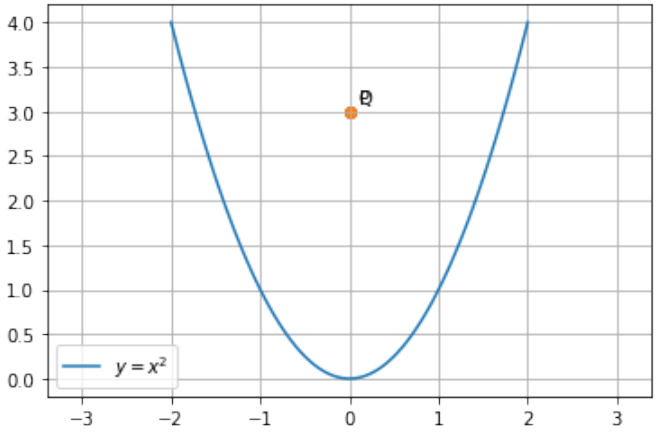

Fig. 2.1: **Q** is closest to **P**