# Assignment 3

K.NIKHITHA

Download all python codes from

https://github.com/K.NIKHITHA/tree/main/Assignment3/Codes

and latex-tikz codes from

https://github.com/K.NIKHITHA/tree/main/Assignment3

## 1 Question No. 2.61

Draw a circle with centre **C** and radius 3.4. Draw any chord. Construct the perpendicular bisector of the chord and examine if it passes through **C**

## 2 Solution

Data from the given quetion:

| | Symbols | Circle1 |
|---|---|---|
| Centre | **C** | $\begin{pmatrix}0\\0\end{pmatrix}$ |
| Radius | $r$ | 3.4 |

TABLE 2.1: Input values

- Let **P** , **Q** are the chord on the circle

$$\mathbf{P} = \begin{pmatrix}1.7\\2.9\end{pmatrix}, \mathbf{Q} = \begin{pmatrix}-2.4\\2.4\end{pmatrix} \tag{2.0.1}$$

- now find the equation of the perpendicular bisector of the line segment joining the points **P**and**Q**
- Let M be the midpoint of two points **P**and**Q**

$$\mathbf{M} = \frac{\mathbf{P}+\mathbf{D}}{2} \tag{2.0.2}$$

$$\implies \mathbf{M} = \frac{\begin{pmatrix}1.7\\2.9\end{pmatrix}+\begin{pmatrix}-2.4\\2.4\end{pmatrix}}{2} \tag{2.0.3}$$

$$\implies \mathbf{M} = \begin{pmatrix}-0.35\\2.6\end{pmatrix} \tag{2.0.4}$$

- The direction vector of line **PQ** is

$$\mathbf{P}-\mathbf{Q} = \begin{pmatrix}1.7\\2.9\end{pmatrix}-\begin{pmatrix}-2.4\\2.4\end{pmatrix} = \begin{pmatrix}4.1\\0.5\end{pmatrix} \tag{2.0.5}$$

- The direction vector of line **PQ** is normal vector of perpendicular bisector. then

$$\mathbf{n} = \begin{pmatrix}0.1\\1\end{pmatrix} \tag{2.0.6}$$

- The equation of line in terms of normal vector is then obtained as

$$\mathbf{n}^T(\mathbf{x}-\mathbf{M}) = 0 \tag{2.0.7}$$

$$\implies \begin{pmatrix}0.1 & 1\end{pmatrix}(\mathbf{x}-\begin{pmatrix}0.05\\0.6\end{pmatrix}) = 0 \tag{2.0.8}$$

$$\implies \begin{pmatrix}\frac{1}{10} & 1\end{pmatrix}\mathbf{x} = \frac{13}{20} \tag{2.0.9}$$

- We got equation of the perpendicular bisector of line segment joining points **P** and **Q**.the line also passes through the center of the circle
- see Fig.2.1 the perpendicular bisector of the line passes through the center of the circle

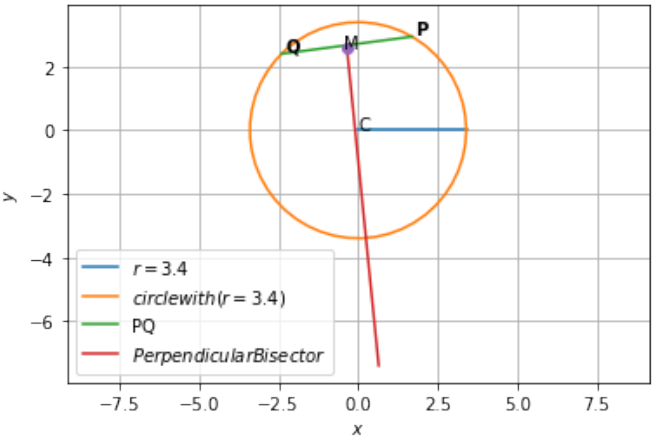


Fig. 2.1: perpendicular bisector of the chord passes through the center