

10.10.2.4

Question : Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

Solution :

Input parameters	Description	Value
\mathbf{O}	Center	$\mathbf{0}$
r	Radius	1
θ_1	$\angle MOA$	127°
θ_2	$\angle MOB$	θ_2°

Table 1: Table of input parameters

Input parameters	Description	Value
\mathbf{u}	Vector	$-\mathbf{O}$
\mathbf{A}	Point	$\begin{pmatrix} \cos \theta_1 \\ \sin \theta_1 \end{pmatrix}$
\mathbf{B}	Point	$\begin{pmatrix} \cos \theta_2 \\ \sin \theta_2 \end{pmatrix}$
\mathbf{m}_1	Direction vector of one tangent	$\begin{pmatrix} -\cos \theta_1 \\ -\sin \theta_1 \end{pmatrix}$
\mathbf{m}_2	Direction vector of another tangent	$\begin{pmatrix} -\cos \theta_2 \\ -\sin \theta_2 \end{pmatrix}$

Table 2: Table of output parameters

To find the angle θ_2 ,

$$OA = OB \quad (1)$$

$$\theta_2 - \theta_1 = 180^\circ \quad (2)$$

$$\theta_2 = 307^\circ \quad (3)$$

Angle between these two tangents is

$$\cos \theta = \frac{\mathbf{m}_1^\top \mathbf{m}_2}{\|\mathbf{m}_1\| \|\mathbf{m}_2\|} \quad (4)$$

$$\text{or, } \theta = \pi \quad (5)$$

Therefore, the two tangents are parallel to each other.

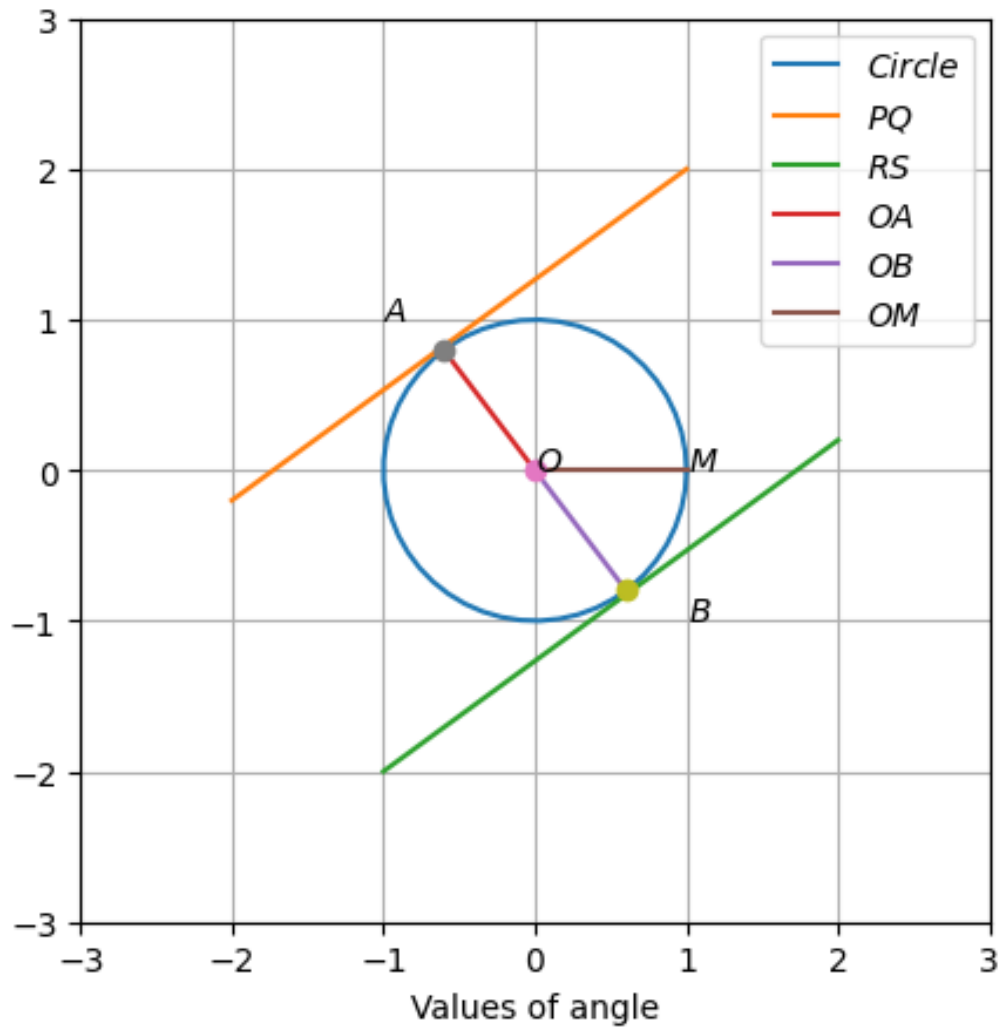


Figure 1: