

## 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
<b>O</b>	Center	<b>0</b>
$r$	Radius	1
$\theta_1$	$\angle MOA$	$127^\circ$
$\theta_2$	$\angle MOB$	$\theta_2^\circ$

Table 1: Table of input parameters

Input parameters	Description	Value
<b>u</b>	Vector	$-\mathbf{O}$
<b>A</b>	Point	$\begin{pmatrix} \cos \theta_1 \\ \sin \theta_1 \end{pmatrix}$
<b>B</b>	Point	$\begin{pmatrix} \cos \theta_2 \\ \sin \theta_2 \end{pmatrix}$
<b>m<sub>1</sub></b>	Direction vector of one tangent	$\begin{pmatrix} -\cos \theta_1 \\ -\sin \theta_1 \end{pmatrix}$
<b>m<sub>2</sub></b>	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  $\theta_2$ ,

$$\mathbf{OA} = \mathbf{OB} \quad (1)$$

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

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

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.

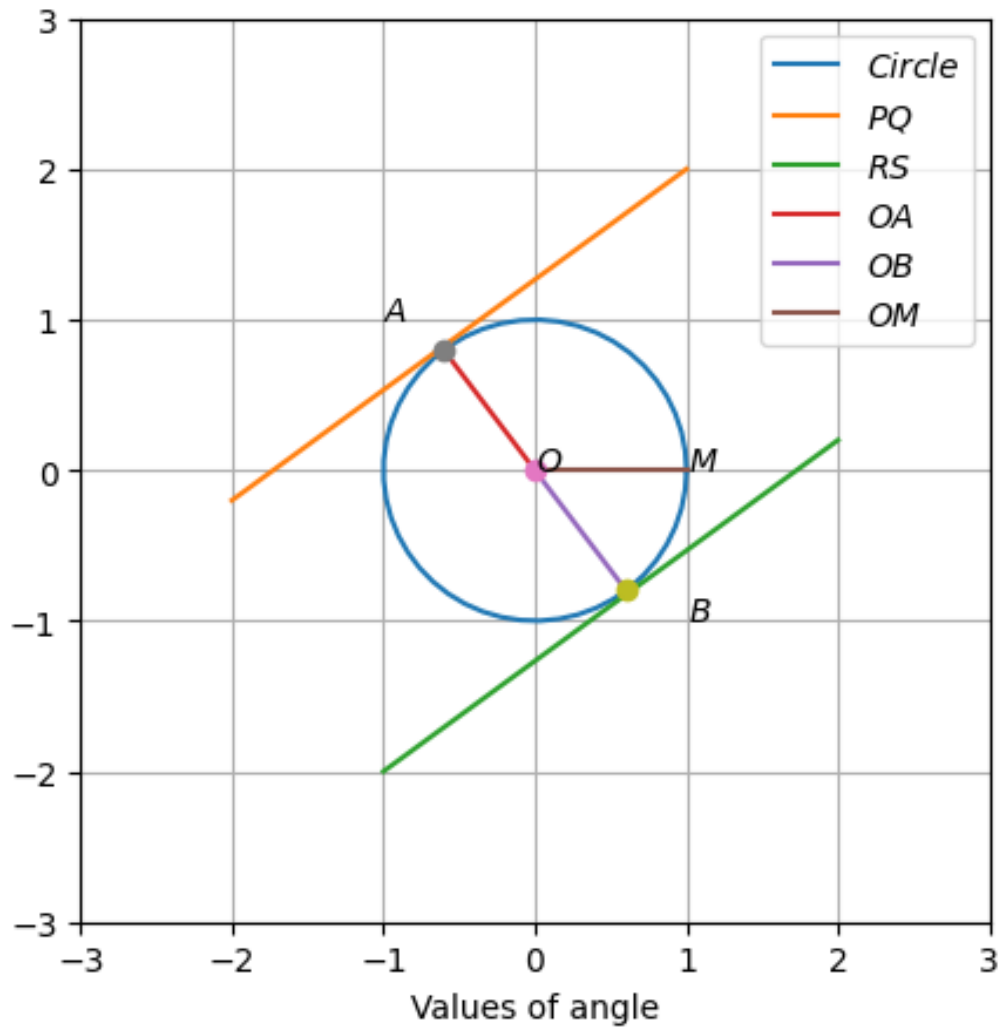


Figure 1: