

# ASSIGNMENT 3

P.Kalpana

Download all python codes from

<https://github.com/ponnaboinakalpana12/ASSIGNMENT3>

and latex-tikz codes from

<https://github.com/ponnaboinakalpana12/ASSIGNMENT3>

Now,

$$\angle AOB + \angle OBP + \angle APB + \angle PAO = 360^\circ \quad (2.0.7)$$

$$\Rightarrow \angle AOB + 90^\circ + 60^\circ + 90^\circ = 360^\circ \quad (2.0.8)$$

$$\angle AOB = 360^\circ - 140^\circ \quad (2.0.9)$$

$$\angle AOB = 120^\circ. \quad (2.0.10)$$

$$\text{From, this} \quad (2.0.11)$$

$$\angle AOP = 60^\circ \quad (2.0.12)$$

## 1 QUESTION No 2.58

Draw a pair of tangents to a circle of radius 5 units which are inclined to each other at an angle of  $60^\circ$

## 2 SOLUTION

Data from the given question :

	Symbols	Circle
Centre	<b>O</b>	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$
Radius	$r$	5

Let  $PA$  and  $PB$  be tangents to circle with radius 5 cm which are inclined to each other at an angle  $60^\circ$ . We know a tangent is always perpendicular to the radius .

$$\therefore OA \perp AP, OB \perp BP. \quad (2.0.1)$$

$$\angle OAP = 90^\circ, \angle OBP = 90^\circ. \quad (2.0.2)$$

We know that, line joining the centre and the external point bisect the angle between pair of tangents from that external point.

$$\angle APB = \theta = 60^\circ$$

OP bisect the angle  $\theta = 60^\circ$

In  $\triangle OAP$ ,

$$\sin \frac{\theta}{2} = \frac{OA}{OP} \quad (2.0.3)$$

$$\frac{1}{2} = \frac{5}{OP} \quad (2.0.4)$$

$$\Rightarrow OP = 10 \quad (2.0.5)$$

$$\therefore \mathbf{O} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{P} = \begin{pmatrix} 10 \\ 0 \end{pmatrix} \quad (2.0.6)$$

**Lemma 2.1.** The coordinates of **A** and **B** can be written as follows:

$$\mathbf{A} = \mathbf{O} + r \begin{pmatrix} \cos \theta \\ \sin \theta \end{pmatrix} \quad (2.0.13)$$

$$\mathbf{B} = \mathbf{O} + r \begin{pmatrix} \cos(360 - \theta) \\ \sin(360 - \theta) \end{pmatrix} \quad (2.0.14)$$

$$\mathbf{B} = \mathbf{O} + r \begin{pmatrix} \cos \theta \\ -\sin \theta \end{pmatrix} \quad (2.0.15)$$

*Proof: Now substitute the values , we get  
For finding coordinate of A:-*

$$\Rightarrow \mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + 5 \begin{pmatrix} \cos 60^\circ \\ \sin 60^\circ \end{pmatrix} \Rightarrow \mathbf{A} = \begin{pmatrix} 2.5 \\ 4.33 \end{pmatrix} \quad (2.0.16)$$

*For finding the coordinate of B:*

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + 5 \begin{pmatrix} \cos 60^\circ \\ -\sin 60^\circ \end{pmatrix} \Rightarrow \mathbf{B} = \begin{pmatrix} 2.5 \\ -4.33 \end{pmatrix} \quad (2.0.17)$$

$$\therefore \mathbf{O} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{P} = \begin{pmatrix} 10 \\ 0 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 2.5 \\ 4.33 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 2.5 \\ -4.33 \end{pmatrix}. \quad (2.0.18)$$

*Plot Tangents PA and PB :*

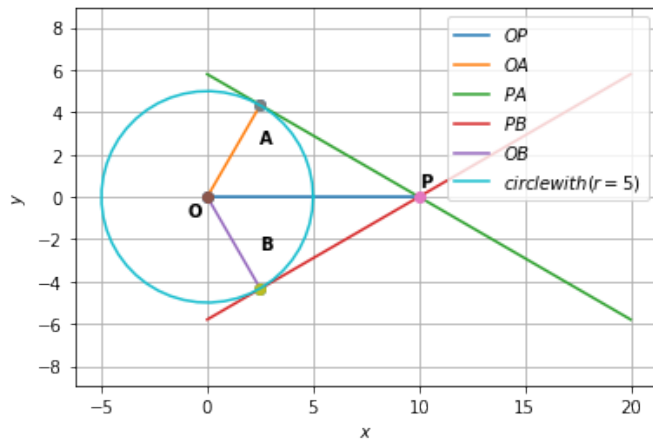


Fig. 2.1: Tangent lines to circle of radius 5 units.