ASSIGNMENT 3

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Download all python codes from

https://github.com/ponnaboinakalpana12/ASSIGNMENT3

and latex-tikz codes from

https://github.com/ponnaboinakalpana12/ASSIGNMENT3

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°

2 Solution

Data from the given question :

	Symbols	Circle
Centre	**O**	$\begin{pmatrix}0\\0\end{pmatrix}$
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°. We know a tangent is always perpendicular to the radius .

$$\therefore OA \perp AP, OB \perp BP. \tag{2.0.1}$$

$$\angle OAP = 90^\circ, \angle OBP = 90^\circ. \tag{2.0.2}$$

We know that, line joining the centre and the external point bisect the angle between pair of tangents from that external point.
$\angle APB = 60^\circ$
In $\triangle OAP$,

$$\sin 30^\circ = \frac{OA}{OP} \tag{2.0.3}$$

$$\frac{1}{2} = \frac{5}{OP} \tag{2.0.4}$$

$$\implies OP = 10 \tag{2.0.5}$$

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

Now,

$$\angle AOB + \angle OBP + \angle APB + \angle PAO = 360^\circ \tag{2.0.7}$$

$$\implies \angle AOB + 90^\circ + 60^\circ + 90^\circ = 360^\circ \tag{2.0.8}$$

$$\angle AOB = 360^\circ - 140^\circ \tag{2.0.9}$$

$$\angle AOB = 120^\circ. \tag{2.0.10}$$

$$From, this \tag{2.0.11}$$

$$\angle AOP = 60^\circ = \theta \tag{2.0.12}$$

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

$$\mathbf{A} = r\begin{pmatrix}\cos\theta\\\sin\theta\end{pmatrix} \tag{2.0.13}$$

$$\mathbf{B} = r\begin{pmatrix}\cos\theta\\\sin\theta\end{pmatrix} \tag{2.0.14}$$

For finding coordinate of A:-

$$\implies \mathbf{A} = 5\begin{pmatrix}\cos 60\\\sin 60\end{pmatrix} \implies \mathbf{A} = \begin{pmatrix}2.5\\4.33\end{pmatrix} \tag{2.0.15}$$

We know that, AO = OB

$$\therefore \mathbf{B} = \begin{pmatrix}2.5\\-4.33\end{pmatrix} \tag{2.0.16}$$

Plot of Tangents PA and PB :

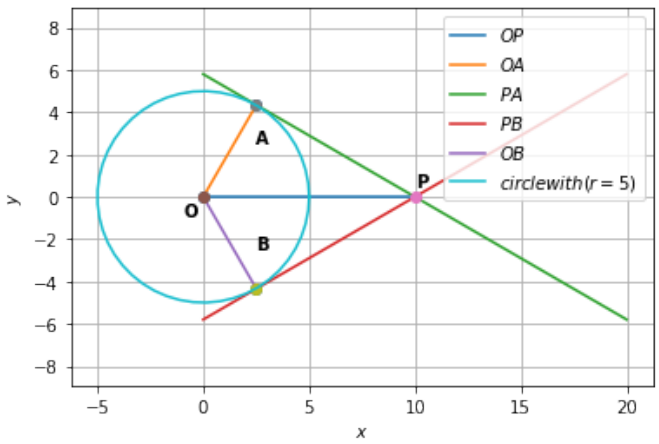

Fig. 2.1: Tangent lines to circle of radius 5 units.