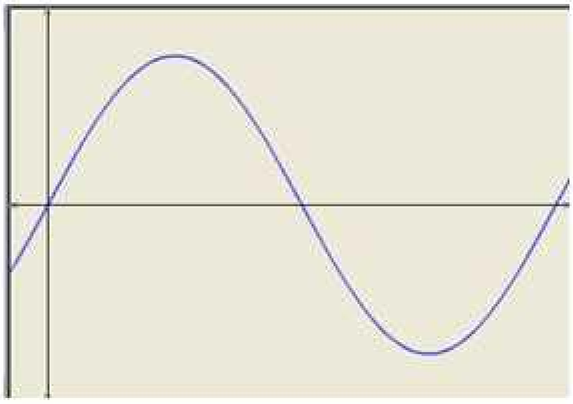
Ex 6.1

Q1

To obtain the graph of $y = 3\sin x$ we first draw the graph of $y = \sin x$ in the interval $[0, 2\pi]$. The maximum and minimum values are 3 and -3 respectively.



We have,

$$y = 2\sin\left(x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad (y - 0) = 2\sin\left(x - \frac{\pi}{4}\right)$$

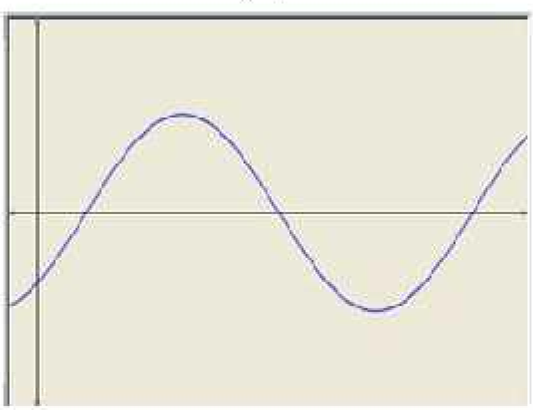
Shifting the origin at $\left(\frac{\pi}{4}, 0\right)$, we have

$$x = X + \frac{\pi}{4} \text{ and } y = Y + 0$$

Substituting these values in (i), we get

$$Y = 2\sin X$$

Thus we draw the graph of $Y = 2\sin X$ and shift it by $\frac{\pi}{4}$ to the right to get the required graph.



We have,

$$y = 2\sin(2x - 1)$$

$$\Rightarrow \quad (y - 0) = 2\sin 2\left(x - \frac{1}{2}\right)$$

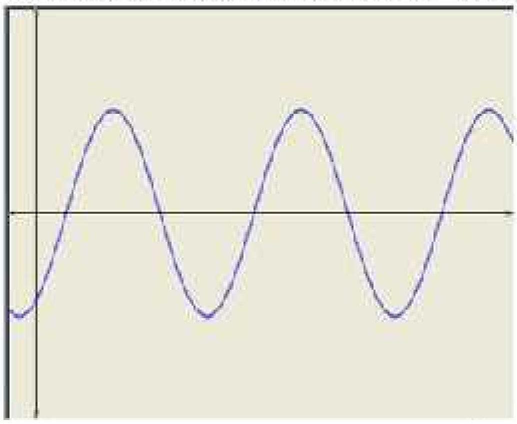
Shifting the origin at $\left(\frac{1}{2}, 0\right)$, we have

$$x = X + \frac{1}{2} \text{ and } y = Y + 0$$

Substituting these values in (i), we get

$$Y = 2\sin 2X$$

Thus we draw the graph of $Y = 2\sin 2X$ and shift it by 1/2 to the right to get the required graph.



We have,

$$y = 3\sin(3x + 1)$$

$$\Rightarrow \quad (y - 0) = 3\sin 3\left(x + \frac{1}{3}\right)$$

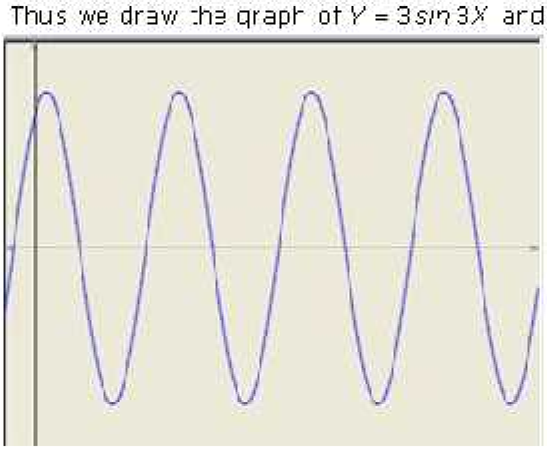
Shifting the origin at $\left(-\frac{1}{3}, 0\right)$, we have

$$x = X - \frac{1}{3} \text{ and } y = Y + 0$$

Substituting these values in (i), we get

$$Y = 3\sin 3X$$

Thus we draw the graph of $Y = 3\sin 3X$ and shift it by 1/3 to the left to get the required graph.



We have,

$$y = 3\sin\left(2x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad (y - 0) = 3\sin 2\left(x - \frac{\pi}{8}\right)$$

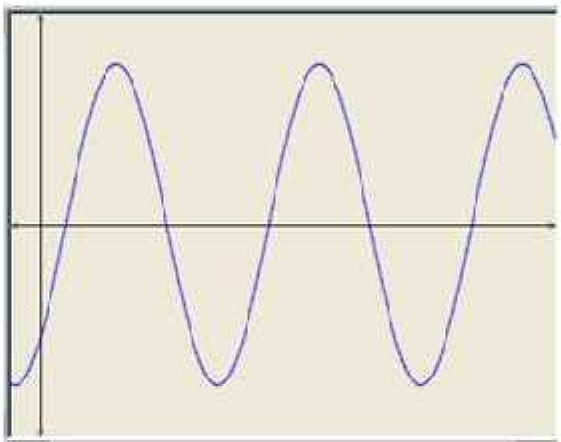
Shifting the origin at $\left(\frac{\pi}{8}, 0\right)$, we have

$$x = X + \frac{\pi}{8} \text{ and } y = Y + 0$$

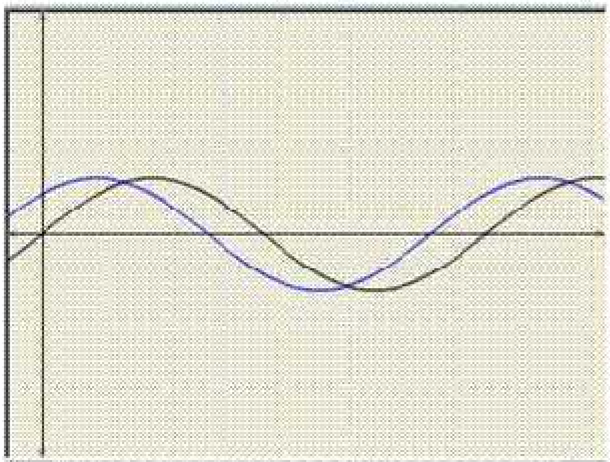
Substituting these values in (i), we get

$$Y = 3\sin 2X$$

Thus we draw the graph of $Y = 3\sin 2X$ and shift it by $\frac{\pi}{8}$ to the right to get the required graph.



Q2



We have,

$$y = \sin\left(x + \frac{\pi}{4}\right)$$

$$\Rightarrow \qquad y - 0 - \sin\left(x - \frac{\pi}{4}\right) \qquad \text{(i)}$$

Shifting the origin at $\left(-\frac{\pi}{4}, 0\right)$, we obtain

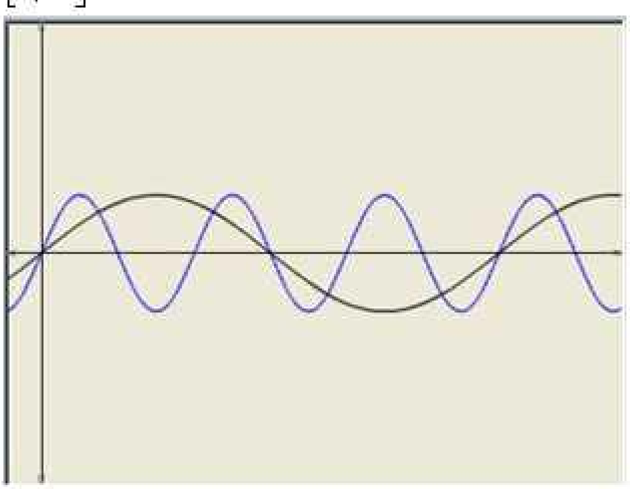
$$x = X - \frac{\pi}{4},\ y = Y + 0$$

Substituting these values in (i), we get

$$Y = \sin X.$$

Thus we draw the graph of $Y = \sin X$ and shift it by $\frac{\pi}{4}$ to the left to get the required graph.

To obtain the graph of $y = \sin 3x$ we first draw the graph of $y = \sin x$ in the interval $[0, 2\pi]$ and then divide the x-coordinates of the points where it crosses x-axis by 3.



Ex 6.2

Q1

We have,

$$y = \cos\left(x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad y - 0 = \cos\left(x + \frac{\pi}{4}\right) \quad \text{---(i)}$$

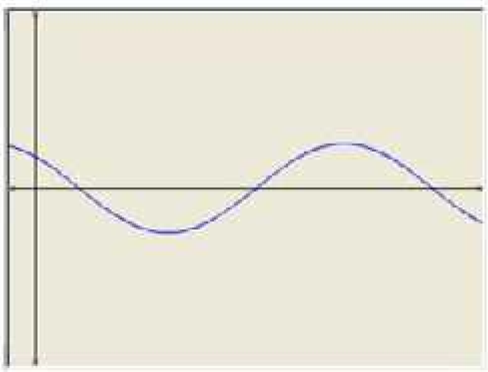
Shifting the origin at $\left(-\frac{\pi}{4}, 0\right)$, we obtain

$$x = X - \frac{\pi}{4}, \; y = Y + 0$$

Substituting these values in (i), we get

$$Y = \cos X.$$

Thus we draw the graph of $Y = \cos X$ and shift it by $\frac{\pi}{4}$ to the left to get the required graph



We have,

$$y = \cos\left(x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad y - 0 = \cos\left(x - \frac{\pi}{4}\right) \quad \text{---(ii)}$$

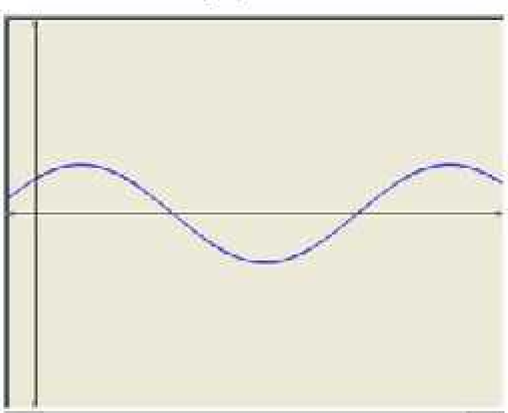
Shifting the origin at $\left(\frac{\pi}{4}, 0\right)$, we obtain

$$x = X + \frac{\pi}{4}, \; y = Y + 0$$

Substituting these values in (ii), we get

$$Y = \cos X.$$

Thus we draw the graph of $Y = \cos X$ and shift it by $\frac{\pi}{4}$ to the right to get the required graph.



We have,

$$y = 3\cos(2x - 1)$$

$$\Rightarrow \qquad (y - 0) = 3\cos 2\left(x - \frac{1}{2}\right)$$

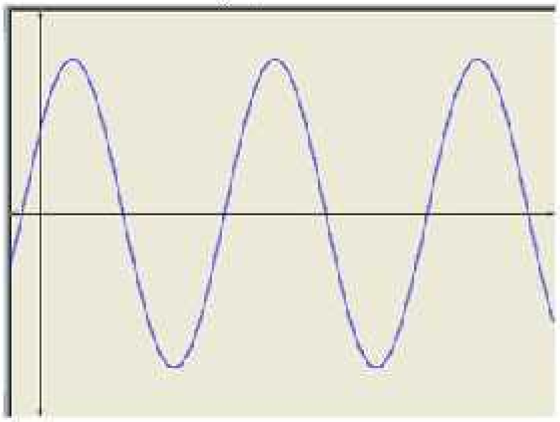
Shifting the origin at $\left(\frac{1}{2}, 0\right)$, we have

$$x = X + \frac{1}{3} \text{ and } y = Y + 0$$

Substituting these values in (i), we get

$$Y = 3\cos 2X$$

Thus we draw the graph of $Y = 3\cos 2X$ and shift it by 1/2 to the right to get the required graph.



We have,

$$y = 2\cos\left(x - \frac{\pi}{2}\right)$$

$$\Rightarrow \qquad y - 0 = 2\cos\left(x - \frac{\pi}{2}\right) \qquad \text{---(i)}$$

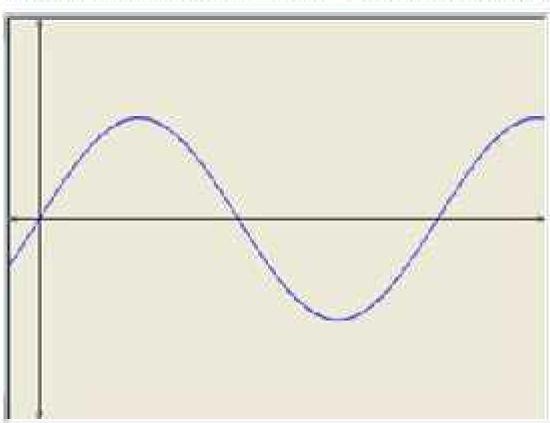
Shifting the origin at $\left(\frac{\pi}{2}, 0\right)$, we obtain

$$x = X + \frac{\pi}{2}, \; y = Y + 0$$

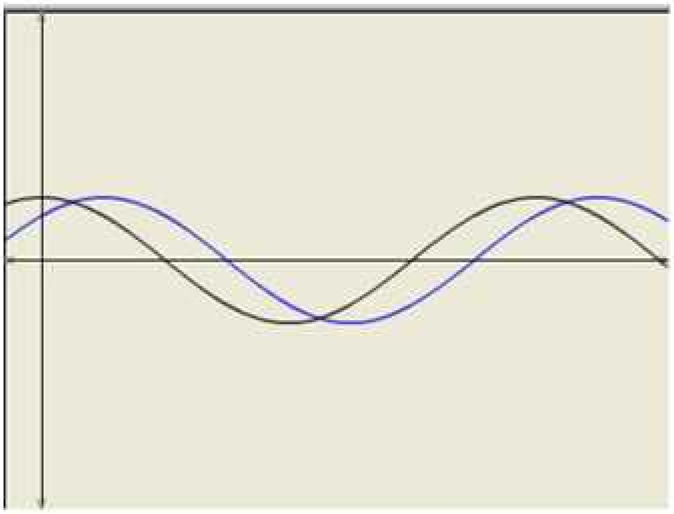
Substituting these values in (i), we get

$$Y = 2\cos X.$$

Thus we draw the graph of $Y = 2\cos X$ and shift it by $\frac{\pi}{2}$ to the right to get the required graph.



Q2



We have,

$$y = \cos 2\left(x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad y - 0 = \cos 2\left(x - \frac{\pi}{4}\right) \qquad \text{---(}\;\text{)}$$

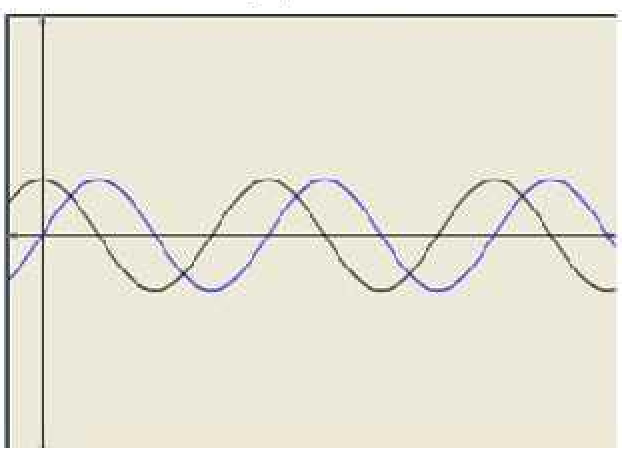
Shifting the origin at $\left(\frac{\pi}{4}, 0\right)$, we obtain

$$x = X + \frac{\pi}{4},\ y = Y + 0$$

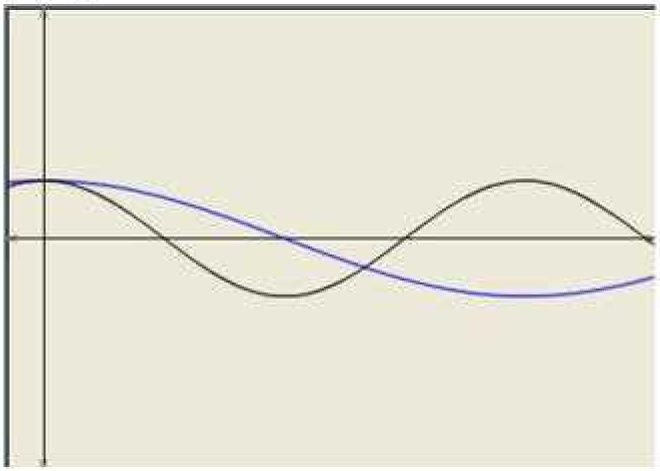
Substituting these values in (i), we get

$$Y = \cos 2X.$$

Thus we draw the graph of $Y = \cos 2X$ and shift it by $\frac{\pi}{4}$ to the right to get the required graph.



To obtain the graph of $y = \cos\dfrac{x}{2}$ we first draw the graph of $y = \cos x$ in the interval $[0,2\pi]$ and then divide the x-coordinates of the points where it crosses x-axis by 1/2.



Ex 6.3

Q1

We know that

$$y = \sin^2 x = \frac{1-\cos 2x}{2} = \frac{1}{2} - \frac{1}{2}\cos 2x$$

We have,

$$y = \frac{1}{2} - \frac{1}{2}\cos 2x$$

$$\Rightarrow \quad y - \frac{1}{2} = -\frac{1}{2}\cos 2x \qquad \text{(i)}$$

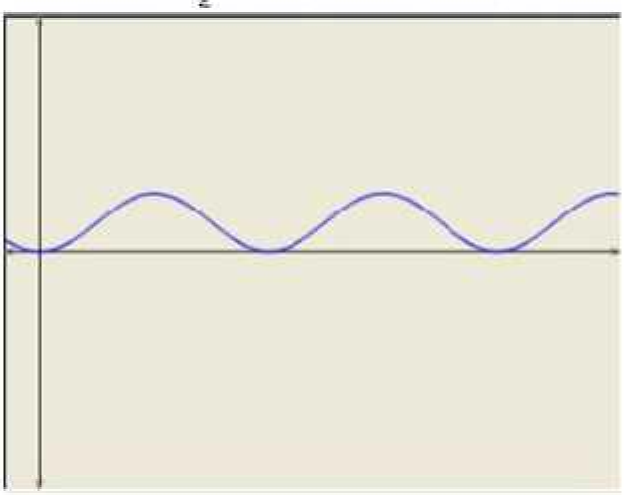
Shifting the origin at $\left(0, -\frac{1}{2}\right)$, we obtain

$$x = X,\ y = Y + \frac{1}{2}$$

Substituting these values in (i), we get

$$Y = -\frac{1}{2}\cos 2X.$$

Thus we draw the graph of $Y = \cos 2X$, adjust the maximum and minimum values to 1/2 and -1/2 and shift it by $\frac{1}{2}$ up to get the required graph.



Q2

We know that

$$y = \cos^2 x = \frac{1 + \cos 2x}{2} = \frac{1}{2} + \frac{1}{2}\cos 2x$$

We have,

$$y = \frac{1}{2} + \frac{1}{2}\cos 2x$$

$$\Rightarrow \quad y - \frac{1}{2} = \frac{1}{2}\cos 2x \qquad \text{---(i)}$$

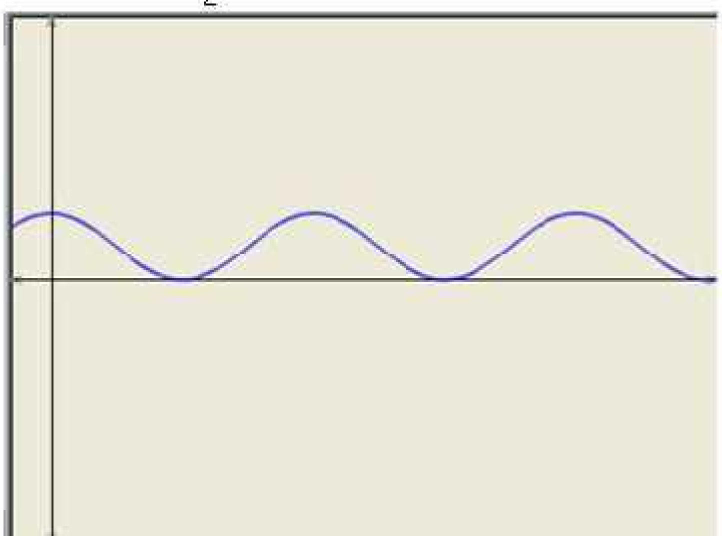
Shifting the origin at $\left(0, -\frac{1}{2}\right)$, we obtain

$$x = X,\ y = Y + \frac{1}{2}$$

Substituting these values in (i), we get

$$Y = -\frac{1}{2}\cos 2X$$

Thus we draw the graph of $Y = \cos 2X$, adjust the maximum and minimum values to 1/2 and -1/2 and shift it by $\frac{1}{2}$ down to get the required graph.



Q3

We have,

$$y = \sin^2\left(x - \frac{\pi}{4}\right)$$

$$\Rightarrow \quad y - 0 = \sin^2\left(x - \frac{\pi}{4}\right) \qquad \text{---(i)}$$

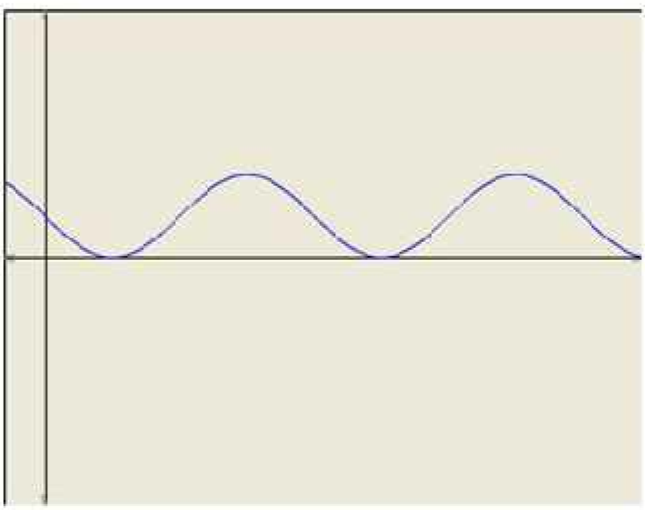
Shifting the origin at $\left(\frac{\pi}{4}, 0\right)$, we obtain

$$x = X + \frac{\pi}{4}, \quad y = Y + 0$$

Substituting these values in (i), we get

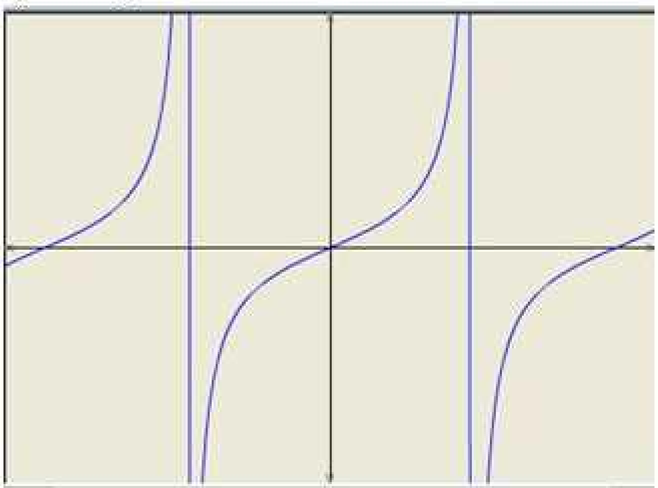
$$Y = \sin^2 X.$$

Thus we draw the graph of $Y = \sin^2 X$ and shift it by $\frac{\pi}{4}$ to the right to get the required graph.



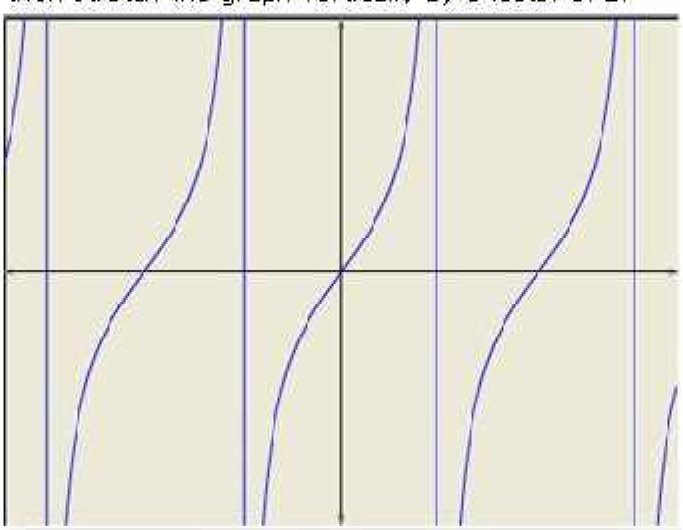
Q4

To obtain the graph of $y = \tan 2x$ we first draw the graph of $y = \tan x$ in the interval $\left(-\frac{\pi}{2}, -\frac{\pi}{2}\right)$ and then divide the x-coordinates of the points where it crosses x-axis by 2.



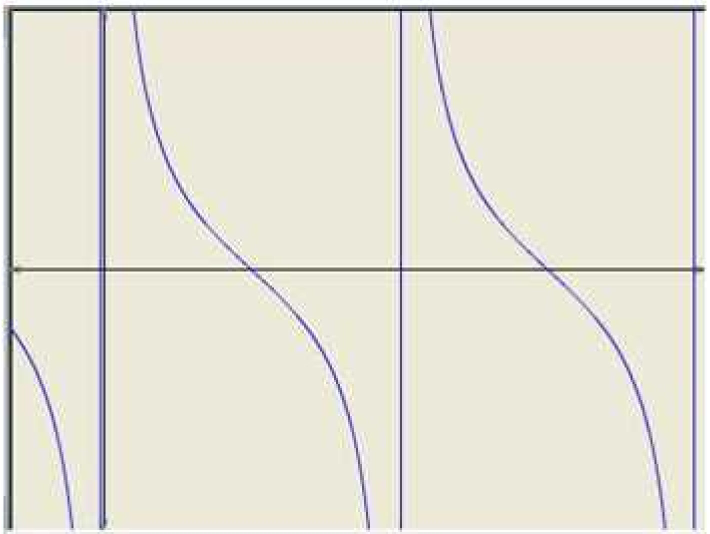
Q5

To obtain the graph of $y = 2\tan 3x$ we first draw the graph of $y = \tan x$ in the interval $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$ and then divide the x-coordinates of the points where it crosses x-axis by 3. We then stretch the graph vertically by a factor of 2.



Q6

To obtain the graph of $y = 2\cot 2x$ we first draw the graph of $y = \cot x$ in the interval $(0,\pi)$ and then divide the x-coordinates of the points where it crosses x-axis by 2. We then stretch the graph vertically by a factor of 2.



Q7

We have,

$$y = \cos 2\left(x - \frac{\pi}{6}\right)$$

$$\Rightarrow \quad y - 0 = \cos 2\left(x - \frac{\pi}{6}\right) \qquad \text{---(i)}$$

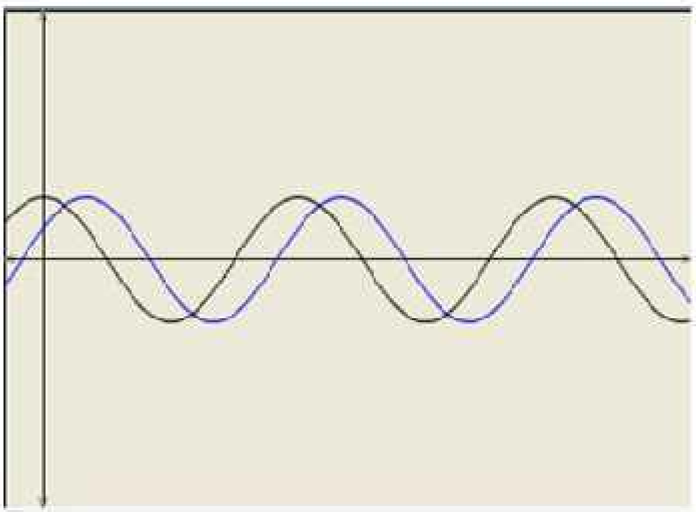
Shifting the origin at $\left(\frac{\pi}{6}, 0\right)$, we obtain

$$x = X + \frac{\pi}{6}, \; y = Y + 0$$

Substituting these values in (i), we get

$$Y = \cos 2X.$$

Thus we draw the graph of $Y = \cos 2X$ and shift it by $\frac{\pi}{6}$ to the right to get the required graph.



Q8

We know that

$$y = sin^2 x = \frac{1-\cos 2x}{2} = \frac{1}{2} - \frac{1}{2}\cos 2x$$

We have,

$$y = \frac{1}{2} - \frac{1}{2}\cos 2x$$

$$\Rightarrow \quad y - \frac{1}{2} = -\frac{1}{2}\cos 2x \qquad \text{---(i)}$$

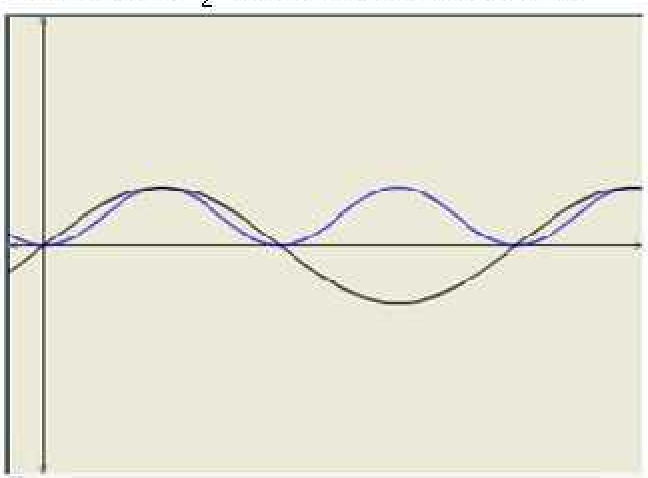
Shifting the origin at $\left(0, -\frac{1}{2}\right)$, we obtain

$$x = X,\; y = Y + \frac{1}{2}$$

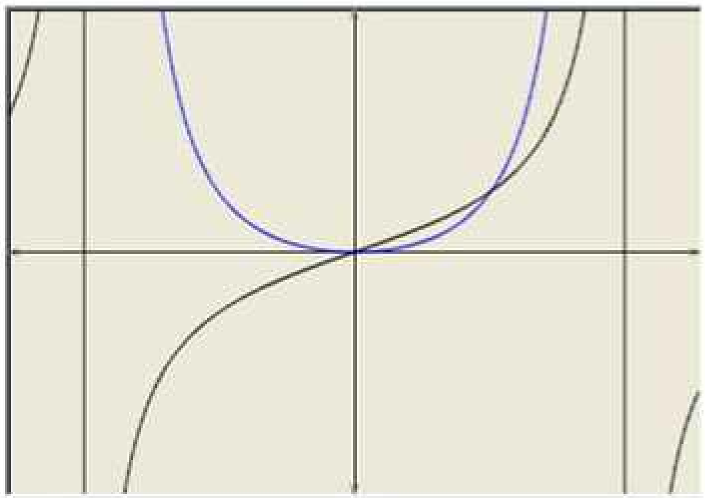
Substituting these values in (i), we get

$$Y = -\frac{1}{2}\cos 2X.$$

Thus we draw the graph of $Y = \cos 2X$, adjust the maximum and minimum values to 1/2 and 1/2 and shift it by $\frac{1}{2}$ up to get the required graph.



Q9



Q10