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5.1 - Radian measure

① a) $\frac{5\pi}{6} = \frac{5\pi}{6} \times \frac{180}{\pi} = 150^\circ$ | d) $0.34 \text{ rad} = 0.34 \times \frac{180}{\pi} = 19.5^\circ$

b) $\frac{\pi}{8} = \frac{\pi}{8} \times \frac{180}{\pi} = 22.5^\circ$ | e) $\sqrt{2} \text{ rad} = \sqrt{2} \times \frac{180}{\pi} = 81.0^\circ$

c) $4\pi = 4\pi \times \frac{180}{\pi} = 720^\circ$ | f) $1.9 \text{ rad} = 1.9 \times \frac{180}{\pi} = 108.9^\circ$

② a) i) $18^\circ = 18 \times \frac{\pi}{180} = \frac{\pi}{10}$

b) i) $16^\circ = 16^\circ \times \frac{\pi}{180} = 0.279 \text{ rad}$

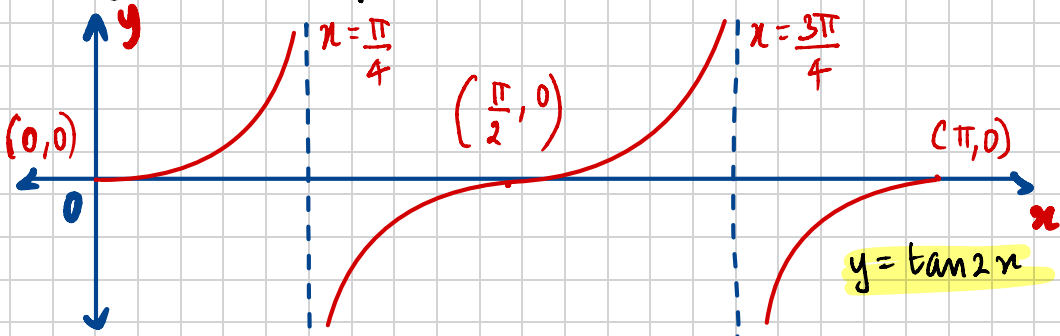
ii) $32.5^\circ = 32.5 \times \frac{\pi}{180} = \frac{13\pi}{72}$

ii) $124^\circ = 124 \times \frac{\pi}{180} = 2.16 \text{ rad}$

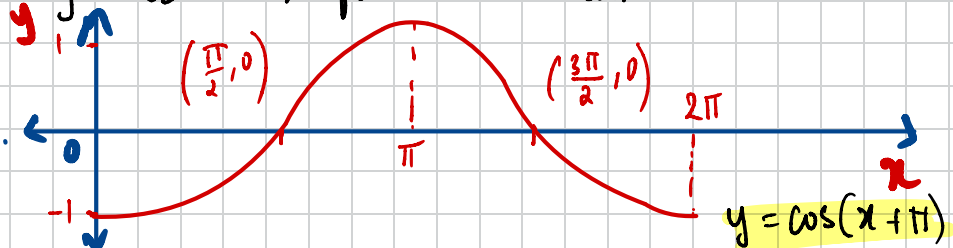
iii) $320^\circ = 320^\circ \times \frac{\pi}{180} = \frac{16\pi}{9}$

iii) $260^\circ = 260 \times \frac{\pi}{180} = 4.54 \text{ rad}$

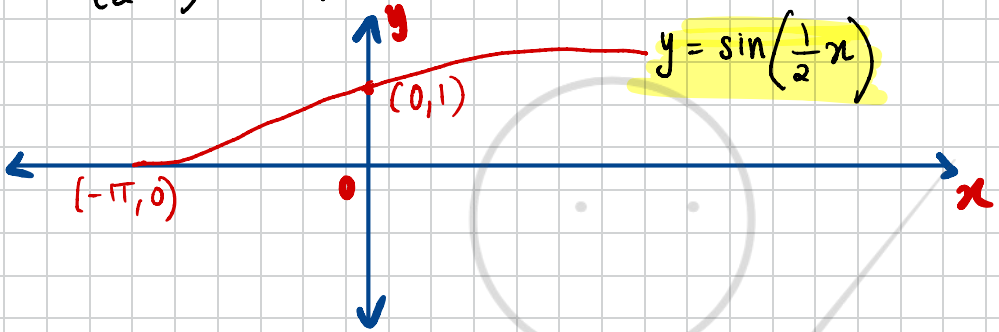
③ a) $y = \tan 2x$ for $0 \leq x \leq \pi$



b) $y = \cos(x + \pi)$ for $0 \leq x \leq 2\pi$



c) $y = \sin\left(\frac{1}{2}x\right) + 1$ for $-\pi \leq x \leq \pi$



④ a) $\cos\left(\frac{9\pi}{3}\right) = \cos(3\pi) = \cos(2\pi + \pi) = \cos 2\pi \cos \pi - \sin 2\pi \sin \pi$

$\Rightarrow 1(-1) - (0)(0) = -1$

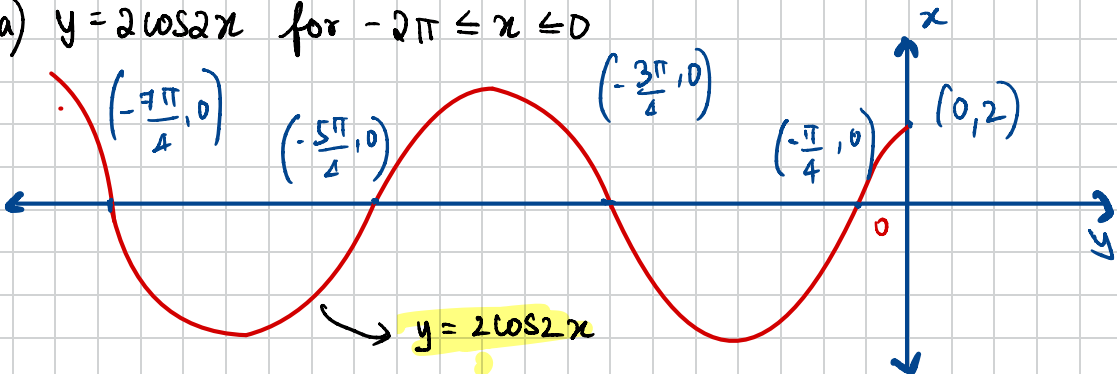
b) $\tan\left[-\frac{3\pi}{4}\right] = -\tan\left[\frac{3\pi}{4}\right] = -\tan\left[\pi - \frac{\pi}{4}\right] = -\left(-\tan\left(\frac{\pi}{4}\right)\right)$

$\Rightarrow \tan\left[\frac{\pi}{4}\right] = 1$

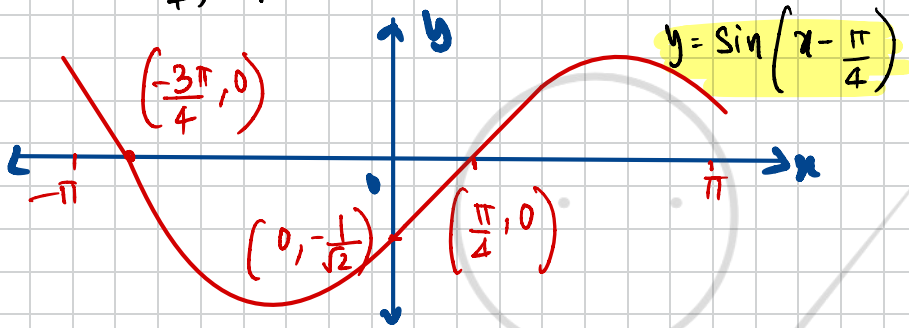
c) $\sin\left[-\frac{11\pi}{6}\right] = -\sin\left[\frac{11\pi}{6}\right] = -\sin\left[2\pi - \frac{\pi}{6}\right] = -\left[-\sin\frac{\pi}{6}\right] = \sin\frac{\pi}{6}$

$= \frac{1}{2}$

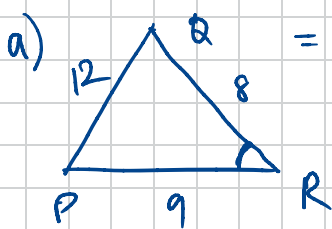
⑤ a) $y = 2\cos 2x$ for $-2\pi \leq x \leq 0$



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



⑥ $\triangle PQR$; $PQ = 12\text{ cm}$ $QR = 8\text{ cm}$ $RP = 9\text{ cm}$



a) $\cos \angle QRP = \frac{9^2 + 8^2 - 12^2}{2(9)(8)} = \frac{1}{144}$

$\angle QRP = \cos^{-1}\left[\frac{1}{144}\right] = 1.56\text{ rad (3sf)}$

b) Area of $PQR = \frac{1}{2}(8)(9)\sin(1.56\text{ rad}) = 35.99 = 36\text{ cm}^2\text{ (3sf)}$

⑦ $y = \sin\left[x + \frac{5\pi}{6}\right]$, $0 \leq x \leq 4\pi$

a) x-axis = $\left[\frac{\pi}{6}, 0\right], \left[\frac{7\pi}{6}, 0\right], \left[\frac{13\pi}{6}, 0\right], \left[\frac{19\pi}{6}, 0\right]$

b) $y = \sin\left[0 + \frac{5\pi}{6}\right] = \sin\left[\frac{5\pi}{6}\right] = \frac{1}{2} \Rightarrow \left[0, \frac{1}{2}\right]$

⑧ a) $(BC)^2 = (800)^2 + (600)^2 - 2(800)(600)\cos\left(\frac{\pi}{9}\right)$

$(BC) = 312.88 = 313\text{ m (3sf)}$

b) $\cos \angle ABC = \frac{(600)^2 + (312.88)^2 - (800)^2}{2(600)(312.88)} = \cos \angle ABC = 119.01$

$= 60.99 = 61.0\text{ (3sf)}$

