1. Determine the equation of the line passing through (1, 4) and perpendicular to (5 points)

$$2y - 5x + 7 = 0$$

Show your work.

$2y = 5x - 7$

$y = \frac{5}{2}x - \frac{7}{2}$, $m = \frac{5}{2}$

Slope of the perpendicular line $= -\frac{2}{5}$

$y - 4 = -\frac{2}{5}(x - 1)$

$y - 4 = -\frac{2}{5}x + \frac{2}{5}$

$\boxed{y = -\frac{2}{5}x + \frac{22}{5}}$

2. Solve for x. Show your work. (5 points)

$$e^{x^2-2} = 8$$

$\ln e^{x^2-2} = \ln 8$

$(x^2 - 2)\ln e = \ln 8$

$x^2 - 2 = \ln 8$

$x^2 = \ln 8 + 2$

$\boxed{x = \pm\sqrt{\ln 8 + 2}}$

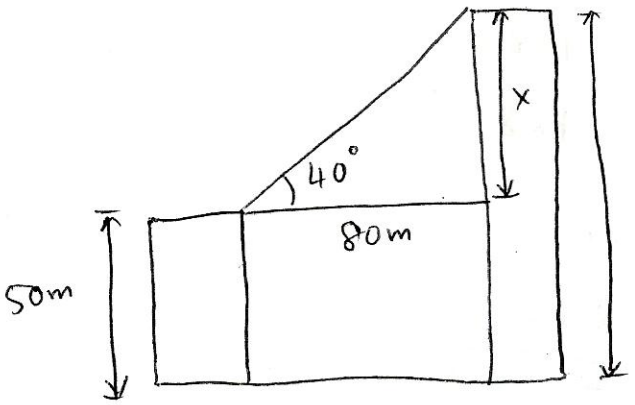
3. On a circle of radius 18 in., find the length of arc subtended by a central angle of (a) 1/3 rad., (b) 75°. Show your work. (10 points)

(a) $s = r\theta = 18 \cdot \frac{1}{3}$ inches = **6 inches**

(b) $75^\circ = 75 \times \frac{\pi}{180}$ rad. $= \frac{5\pi}{12}$ rad.

$s = r\theta = 18 \cdot \frac{5\pi}{12}$ inches $= \frac{15\pi}{2}$ inches = **23.56 inches**

4. Two buildings with flat roofs are 80 m apart. From the roof of the shorter building, 50 m in height, the angle of elevation to the edge of the roof of the taller building is 40°. How high is the taller building? Show your work. (10 points)



$\frac{x}{80} = \tan 40^\circ$

$x = \tan 40^\circ \cdot 80$

$= 67.12$ m.

Length of the taller building

$= 67.12\text{ m} + 50\text{ m}$

$=$ **117.12 m**

5. Find all angles, $0° \leq \theta < 360°$, for which (10 points)
(a) $\sin\theta = -0.6180$, (b) $\cos\theta = 0.9063$. Show your work.

(a) $\sin\theta = -0.6180$

$\sin R = 0.6180$

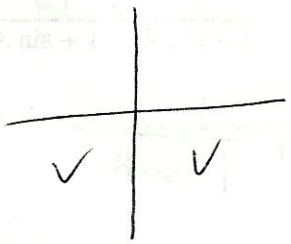
$R = 38.17°$

III rd Quad $\theta = 180° + 38.17°$

$= \boxed{218.17°}$

IV th Quad $\theta = 360° - 38.17°$

$= \boxed{321.83°}$



(b) $\cos\theta = 0.9063$

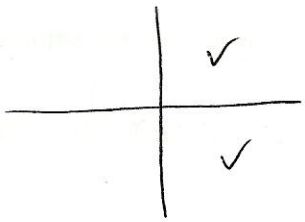
$\cos R = 0.9063$

$R = 25°$

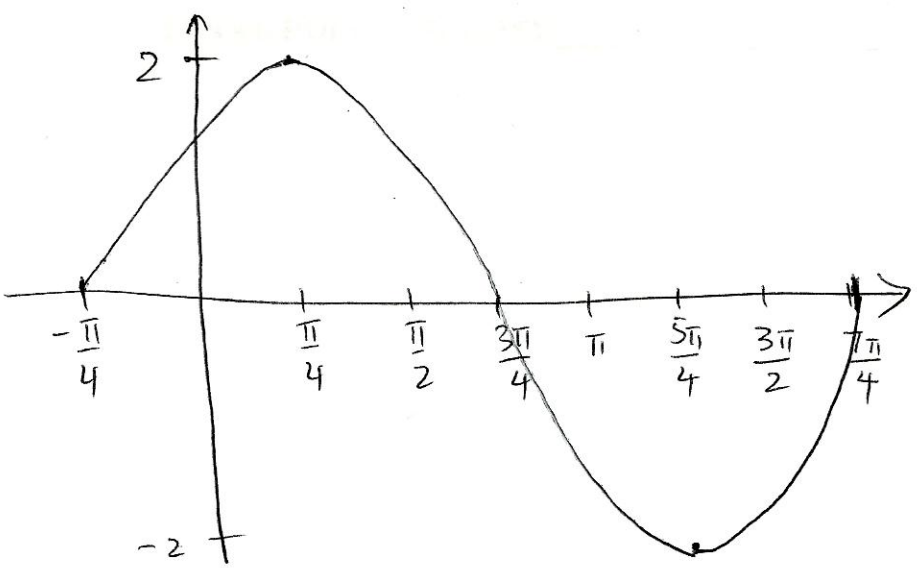
I st Quad $\theta = \boxed{25°}$

IV th Quad $\theta = 360° - 25°$

$= \boxed{325°}$



6. Starting with the graph of $y = \sin x$, sketch the graph of $y = 2\sin(x + \pi/4)$ for one complete period. Show your work. (5 points)



x	y
$-\frac{\pi}{4}$	0
0	$\sqrt{2}$
$\frac{\pi}{4}$	2
$\frac{\pi}{2}$	$\sqrt{2}$
$\frac{3\pi}{4}$	0
π	$-\sqrt{2}$
$\frac{5\pi}{4}$	-2
$\frac{3\pi}{2}$	$-\sqrt{2}$
$\frac{7\pi}{4}$	0

7. Verify the following identity. Show your work. (5 points)

$$\frac{1}{1-\sin A}+\frac{1}{1+\sin A}=2\sec^2 A$$

$$\text{LHS} = \frac{1}{1-\sin A} + \frac{1}{1+\sin A}$$

$$= \frac{1+\sin A + 1-\sin A}{(1-\sin A)(1+\sin A)}$$

$$= \frac{2}{1-\sin^2 A}$$

$$= \frac{2}{\cos^2 A}$$

$$= 2 \cdot \frac{1}{\cos^2 A} = 2\sec^2 A = \text{RHS}.$$