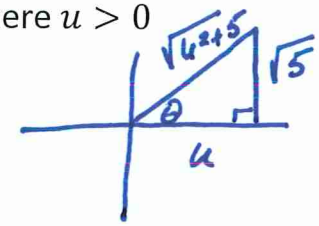
out of 35 points

MAC1114 Test 3 Name Key

Show all work for credit.

1. Find the exact value of $\sin(\cos^{-1}\left(\frac{u}{\sqrt{u^2+5}}\right))$ where $u > 0$

$\cos\theta = \frac{u}{\sqrt{u^2+5}} = \frac{Adj}{Hyp}$



$\sin\theta = \frac{Opp}{Hyp} = \boxed{\frac{\sqrt{5}}{\sqrt{u^2+5}} = \sqrt{\frac{5}{u^2+5}}}$

$u^2 + Opp^2 = \left(\sqrt{u^2+5}\right)^2$

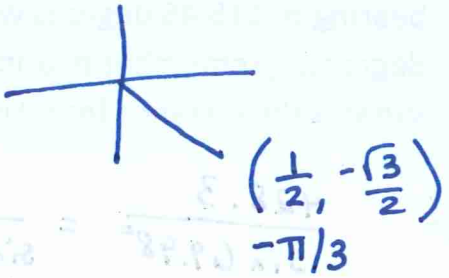
$Opp^2 = u^2 + 5 - u^2$

$Opp = \sqrt{5}$

(5)

2. Find the exact value of $arcsin\left(\frac{-\sqrt{3}}{2}\right)$ in radians

$\sin\theta = -\frac{\sqrt{3}}{2}$ where $-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$



(5)

$\boxed{\theta = -\frac{\pi}{3}}$

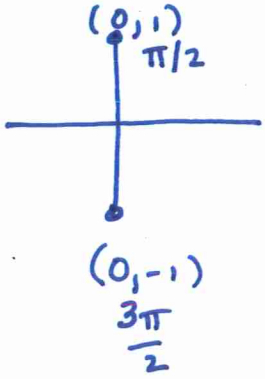
3. Solve for all exact solutions in radians of $sin^2x\,cosx = cosx$

(5)

$\sin^2 x\cos x - \cos x = 0$

$\cos x\left(\sin^2 x - 1\right) = 0$

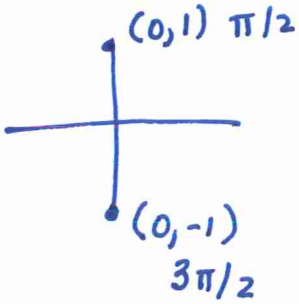
$\cos x = 0$



$\sin^2 x - 1 = 0$

$\sqrt{\sin^2 x} = \sqrt{1}$

$\sin x = \pm 1$



$\boxed{x = \frac{\pi}{2} + \pi k}$

4. Solve for all exact solutions in radians of $\sin(3x) = -1$

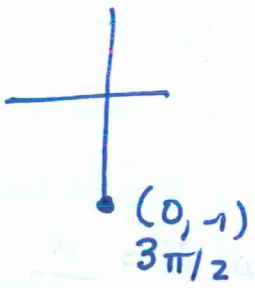
5

$\sin\theta = -1$

$\theta = \frac{3\pi}{2} + 2\pi k$

$3x = \frac{3\pi}{2} + 2\pi k$

$x = \frac{\pi}{2} + \frac{2\pi}{3}k$



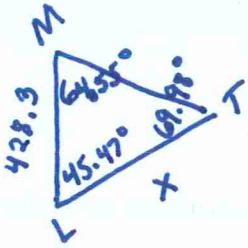
5. Mark and Lisa are standing on the same side of a riverbank 428.3 m apart. The river is flowing north. On the other side of the river, Mark spots a tree at a bearing of 115.45 degrees while Lisa spots the same tree on a bearing of 45.47 degrees. (Remember bearing measures the angle from North rotating clockwise.) What is the distance from Lisa to the tree?

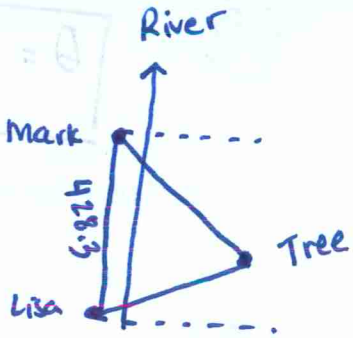
5

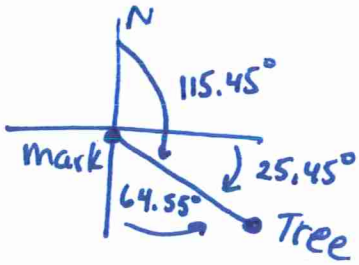
$\frac{428.3}{\sin 69.98^\circ} = \frac{x}{\sin 64.55^\circ}$

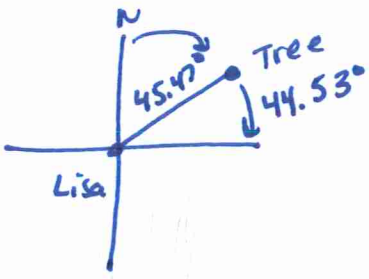
$x = \frac{428.3 \sin 64.55^\circ}{\sin 69.98^\circ} = 411.6103447$

411.6 m









6. Given triangle ABC where A = 43.5 degrees, a = 10.7 in, and c = 7.2 in, find angle C.

(5)

$$\frac{\sin C}{c} = \frac{\sin A}{a}$$

$$\frac{\sin C}{7.2} = \frac{\sin 43.5^\circ}{10.7}$$

$$\sin C = \frac{7.2 \sin(43.5^\circ)}{10.7}$$

$$C = \sin^{-1}\left[\frac{7.2 \sin(43.5^\circ)}{10.7}\right] = 27.59326523^\circ$$

$$\boxed{C = 27.6^\circ}$$

7. Given triangle ABC where C = 45.6 degrees, b = 8.94 m, a = 7.23 m, find angle B.

(5)

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c = \sqrt{a^2+b^2-2ab\cos C} = \sqrt{7.23^2 + 8.94^2 - 2(7.23)(8.94)\cos(45.6^\circ)}$$

$$c = 6.461372979$$

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin B}{8.94} = \frac{\sin(45.6^\circ)}{6.461372979}$$

$$\sin B = \frac{8.94 \sin(45.6^\circ)}{6.461372979}$$

$$B = \sin^{-1}\left[\frac{8.94 \sin(45.6^\circ)}{6.461372979}\right] = 81.32101621^\circ$$

$$\boxed{B = 81.3^\circ}$$