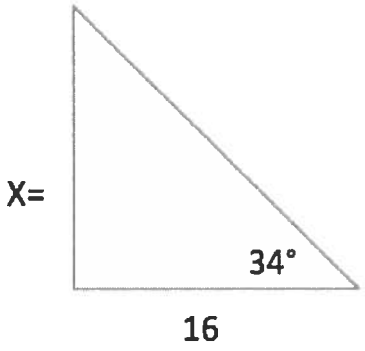
Name: Answer Key Date:

PreCalculus Spring Practice Midterm

1. Solve for the missing side or angle using your trigonometric laws and ratios.

a. Find the unknown side x.

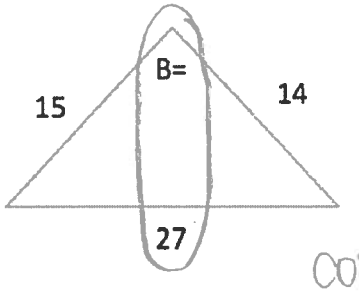


$\tan(34) = \frac{x}{16}$

$16\tan(34) = x$

$10.79 = x$

b. Find the unknown angle B.



SSS → Law of cosine

$27^2 = 15^2 + 14^2 - 2(15)(14)\cos B$

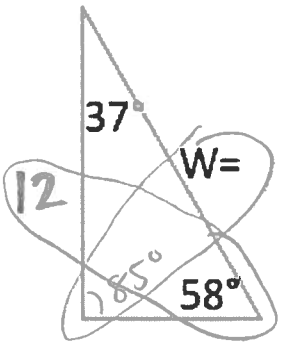
$729 = 421 - 420\cos B$

$308 = -420\cos B$

$\cos^{-1}(-.73) = \cos^{-1}(\cos B)$

$137.17° = B$

c. Find the unknown side W.



$\frac{\sin 58}{12} = \frac{\sin 85}{W}$

$\frac{W\sin(58)}{\sin(58)} = \frac{12\sin 85}{\sin(58)}$

$W = 14.1$

2. Prove the following trigonometric identities.

a. $\dfrac{\sin x+\cos x}{\sec x+\csc x}=\sin x\cos x$ $(\sec x+\csc x)$

$\sin x+\cos x = \sin x\cos x\sec x + \sin x\cos x\csc x$

$\sin x+\cos x = \sin x\cos x\left(\frac{1}{\cos x}\right) + \sin x\cos x\left(\frac{1}{\sin x}\right)$

$\sin x+\cos x = \sin x+\cos x$ ✓

b. $\dfrac{\cos\theta}{\sec\theta}+\dfrac{\sin\theta}{\csc\theta}=1$

$\dfrac{\cos\theta}{\frac{1}{\cos\theta}} + \dfrac{\sin\theta}{\frac{1}{\sin\theta}} = 1$

$\cos^2\theta + \sin^2\theta = 1$

$1 = 1$ ✓

3. Solve the following trigonometric equations (hint: your answer will be in equation format).

a. $6\sin^2\theta + \sin\theta - 1 = 0$

$6x^2 + x - 1 = 0$

$(3x - 1)(2x + 1) = 0$

$(3\sin\theta - 1)(2\sin\theta + 1) = 0$

$3\sin\theta - 1 = 0$

$\sin\theta = 1/3$

$\theta = 19.47^\circ \Rightarrow \frac{19.47\pi}{180} + 2\pi n$

& $180 - 19^\circ = 161^\circ \Rightarrow \frac{161\pi}{180} + 2\pi n$

$2\sin\theta + 1 = 0$

$\sin\theta = 1/2$

$\theta = 30^\circ \Rightarrow \frac{\pi}{6} + 2\pi n$

$180 - 30 = 120^\circ \Rightarrow \frac{2\pi}{3} + 2\pi n$

b. $2\cos\theta + 1 = 0$

$\cos\theta = -1/2$

$\theta = 120 \cdot \frac{\pi}{180} = \frac{2\pi}{3} + 2\pi n$

$360 - 120 = 240 \cdot \frac{\pi}{180} = \frac{4\pi}{3} + 2\pi n$

4. Convert the (x, y) point (-3, 0) to polar coordinates.

$r^2 = (-3)^2 + (0)^2$

$r^2 = 9$

$r = 3$

$\tan\theta = \frac{0}{3}$

$\tan\theta = 0$

$\theta = 0$ or π

$\theta = 0$ or 180

but based on quadrant it's 180° (π)

$(3, \pi)$

5. Convert the polar coordinates $(\sqrt{2}, \frac{\pi}{4})$ to (x,y) coordinates.

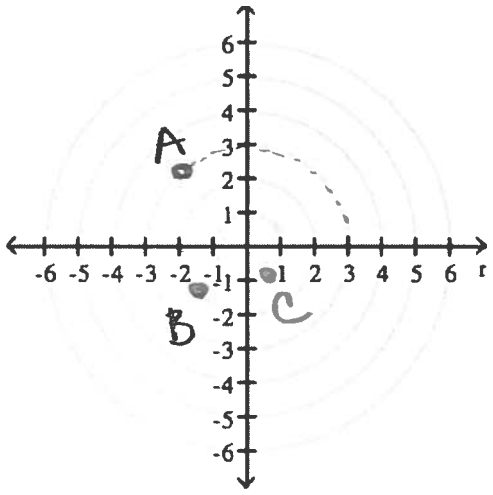
$x = r\cos\theta = \sqrt{2}\cos(\pi/4) = \sqrt{2} \cdot \frac{\sqrt{2}}{2} = \frac{2}{2} = 1$

$y = r\sin\theta = \sqrt{2}\sin(\pi/4) = \sqrt{2} \cdot \frac{\sqrt{2}}{2} = \frac{2}{2} = 1$

$(1, 1)$

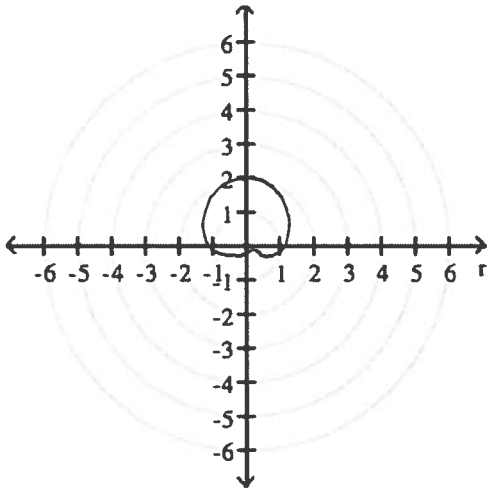
6. Graph the following polar coordinates

a. $(3, \frac{3\pi}{4})$ b. $(-2, \frac{\pi}{4})$ c. $(1, \frac{5\pi}{3})$



7. Graph the following polar equations (be sure to be accurate in the radius).

a. $r = 1 + \sin\theta$



b. $r = 2 - 2\cos(2\theta)$