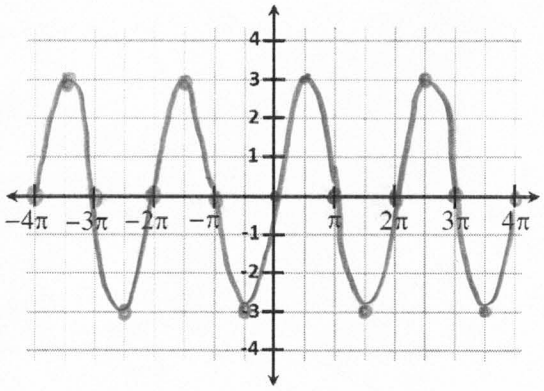
Name: KEY Per. ____

Pre-Calculus Test Chapter 4 Part 2 Form A Show ALL work!!!

1 Graph $y = 3\sin x$ along the whole grid.



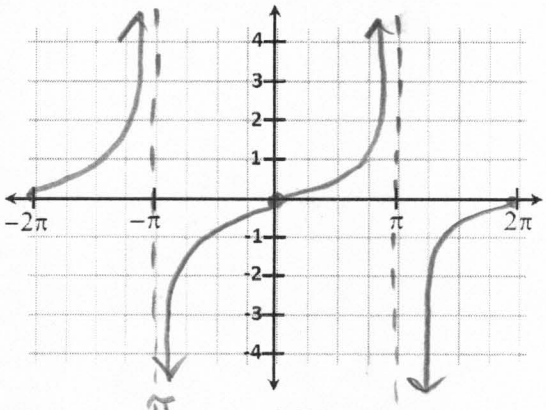
Amplitude: $|3| = 3$

Period: 2π

4 Parts

$\frac{2\pi}{4} = \frac{\pi}{2}$

2 Graph $y = \tan\frac{x}{2}$ along the whole grid.

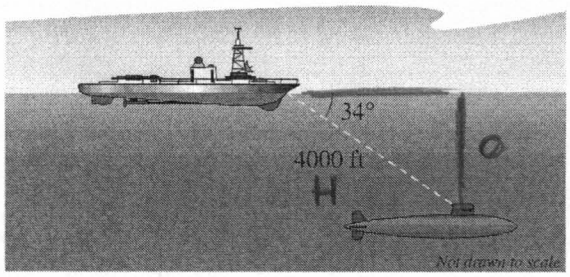


Period: $\frac{\pi}{\frac{1}{2}} = 2\pi$

2 Parts

$\frac{2\pi}{2} = \pi$

3 **Sonar** The sonar of a navy cruiser detects a submarine that is 4000 feet from the cruiser. The angle between the water line and submarine is 34°. How deep is the submarine.



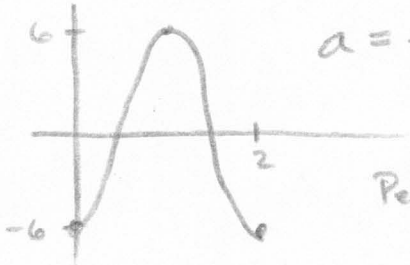
$4000 \cdot \sin 34° = \frac{O}{4000} \cdot 4000$

$O = 4{,}000 \sin 34°$

$= \boxed{2{,}236.8 \text{ ft}}$

4 **Oscillation of a Spring** Write the equation for the simple harmonic motion of a ball on a spring that starts at its lowest point of 6 inches below equilibrium, bounces to its maximum height of 6 inches above equilibrium, and returns to its lowest point in a total of 2 seconds.

$d = a\cos\omega t$



$a = -6$

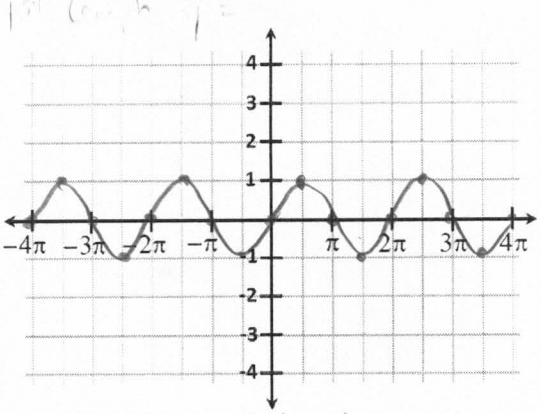
Period: $\frac{2\pi}{\omega} = 2$

$\frac{2\pi}{2} = \frac{2\omega}{2}$

$\omega = \pi$

$\boxed{d = -6\cos\pi t}$

5 Graph $y = \cos\left(x - \frac{\pi}{2}\right)$ along the whole grid.



Amplitude: $|1| = 1$

Period: 2π

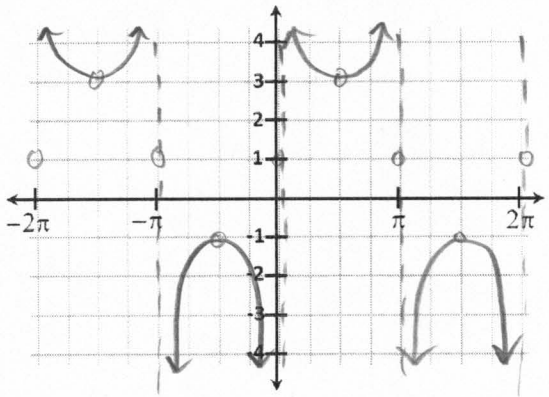
Phase Shift: $x - \frac{\pi}{2} = 0$ $x = \frac{\pi}{2}$ START

4 Parts

$\frac{2\pi}{4} = \frac{\pi}{2}$

END $\frac{\pi}{2} + 2\pi = \frac{5\pi}{2}$

6 Graph $y = 2\csc x + 1$ along the whole grid.



1st Graph $y = 2\sin x + 1$

Amplitude: $|2| = 2$

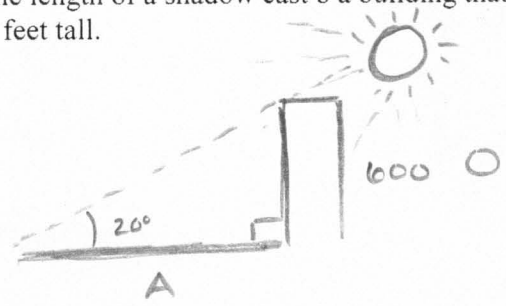
Period: 2π

Vertical Translation: 1 unit up

4 Parts

$\frac{2\pi}{4} = \frac{\pi}{2}$

7 **Shadows** The sun is 20° above the horizon. Find the length of a shadow cast b a building that is 600 feet tall.



$A \tan 20° = \frac{600}{A}$ A

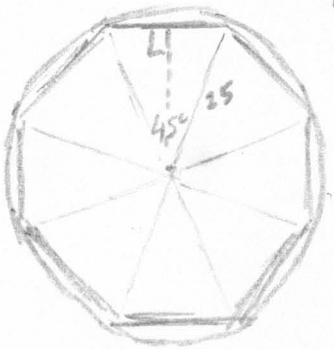
$A \frac{\tan 20°}{\tan 20°} = \frac{600}{\tan 20°}$

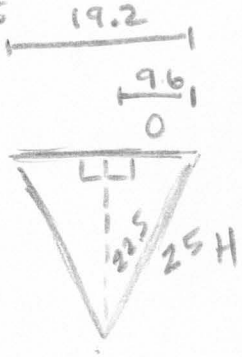
$A = \frac{600}{\tan 20°}$

$= \boxed{1,648.5 \text{ ft}}$

8 **Geometry** Find the length of the sides of a regular octagon inscribed in a circle of radius 25 inches.

$\frac{360}{8} = 45$





$25 \sin 22.5 = \frac{0}{25}$ 25

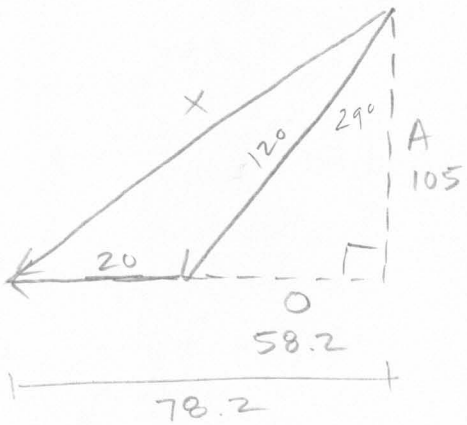
$0 = 9.6$

$\boxed{19.2 \text{ in.}}$

9 **Navigation** A ship leaves port at noon and has a bearing of S 29° W. The ship sails at 20 nautical miles per hour. At 6:00 P.M., the ship changes course to due west. What is the ship's bearing and distance from the port of departure at 7:00 P.M.?

Bearing: S 36.7 W

Distance: 130.9 nm



$120 \sin 29 = \frac{O}{120} \cdot 120$

$O = 58.2$

$120 \cos 29 = \frac{A}{120} 120$

$A = 105$

$(78.2)^2 + (105)^2 = x^2$

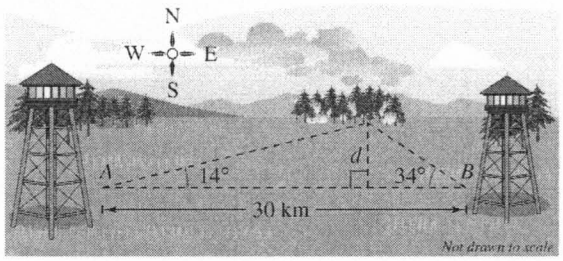
$x = 130.9$

$\tan\theta = \frac{78.2}{105}$

$\tan^{-1}\tan\theta = \tan^{-1}\left(\frac{78.2}{105}\right)$

$\theta = 36.7$

10 **Location of a Fire** Two fire towers are 30 kilometers apart, where tower A is due west of tower B. A fire is spotted from the towers, and the bearings from A and B are N 76° E and N 56° W, respectively. Find the distance d of the fire from the line segment AB.



$\tan 14 = \frac{d}{30-x}$ $\tan 34 = \frac{d}{x}$

$d = (30-x)\tan 14$ $d = x\tan 34$

$30\tan 14 - x\tan 14 = x\tan 34$

$+x\tan 14 \quad +x\tan 14$

$30\tan 14 = x\tan 34 + x\tan 14$

$30\tan 14 = x(\tan 34 + \tan 14)$

$x = \frac{30\tan 14}{\tan 34 + \tan 14}$

$x = 8.1$

$d = 8.1\tan 34°$

$d = \boxed{5.5 \text{ km}}$