Name: Key **Period:** ______ **Date:** __________

PreCalculus CH 5 Practice Test

Answer the following questions.

1. What does it mean for a function to have a **period** of 2π?

The length of each cycle (repetition) is 2π.

2. Consider a soundwave. If the volume is to be increased, what changes? If the note or the pitch is to be changed, what in the equation changes?

Volume: amplitude is changed; pitch: "ω" changes.

3. Find the period and the amplitude (if applicable) of the following functions.

a. $f(t) = 4\sin t$

$a=4,\ k=1$

Per: $\frac{2\pi}{k} \Rightarrow \frac{2\pi}{1} = \boxed{2\pi}$

Amp: $|4| = \boxed{4}$

b. $f(t) = \frac{2}{3}\cos 3t$

$a=2/3\quad k=3$

Per: $\boxed{\frac{2\pi}{3}}$

Amp: $|2/3| = \boxed{2/3}$

c. $f(t) = \tan 7\pi$

$a=1\quad k=7$

Per = $\cancel{\ }$ $1/7$

Amp: $|1| = \boxed{1}$

d. $f(t) = \csc\frac{16}{8}\pi(t-9)$

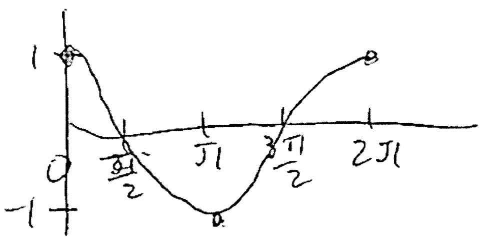
$a=1\quad k=\cancel{\frac{16\pi}{8}}$

per: $\frac{2\pi}{16\pi/8} = \frac{2\pi}{1}\cdot\frac{8}{16\pi} = \boxed{1}$

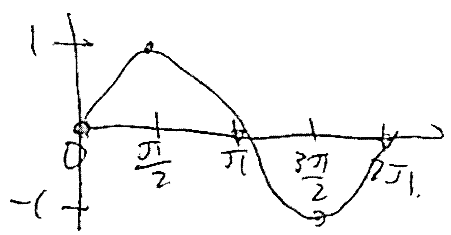
Amp: $|1| = \boxed{1}$.

4. Sketch the graph of the standard cosine and sine functions.

a. $y = \cos x$ amp: 1 per: 2π.

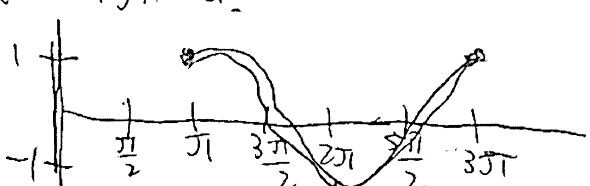


b. $y = \sin x$ amp = 1 per. = 2π.



5. Now, graph $y = \cos(x-\pi)$, **without** having to make a table, but simply by transforming the graph of $y = \cos x$ from #4.

Shift: right π.

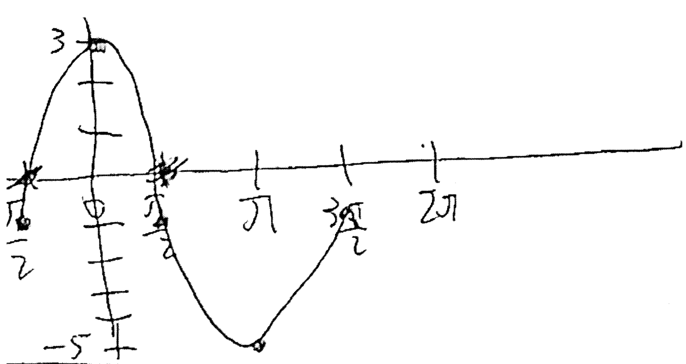


6. Sketch the following graph: $y = 4\sin\left(\pi + \frac{\pi}{2}\right) - 1$

Shift: left $\pi/2$, down 1

Amp: $|4| = 4$ hgt: $4 \to 3$

l-pt: $-4 \to -5$.



7. Evaluate the following trigonometric functions. (No Calculators! Do not put answer in decimal)

a. $\sin\frac{5\pi}{3}$ $-\sqrt{3}/2$

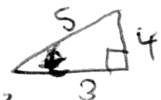
b. $\sin\frac{15\pi}{4}$ $-\sqrt{2}/2$

c. $\cos(2\pi + \frac{5\pi}{6})$ $-\sqrt{3}/2$. (it's like $\cos\frac{5\pi}{6}$)

d. $\tan\frac{3\pi}{4}$ $= \sin/\cos$ $\boxed{-1}$

e. $\sec\frac{\pi}{3}$ $1/\cos$ $\boxed{2}$

8. If $\sin t = \frac{-4}{5}$ and t is in quadrant III, find the values of all other trig functions at t. (Make a reference triangle)



Soh Cah Toa

$a^2 + 4^2 = 5^2$

$a^2 + 16 = 25$

$a^2 = 9 \Rightarrow a = 3$

$\cos t = -3/5$ $\sec t = -5/3$

$\tan t = 4/3$ $\csc t = -5/4$ $\cot t = 3/4$.

9. Write the Pythagorean Identity, and use it to express $\sin t$ in terms of $\cos t$ and vice-versa.

a. Pythagorean Identity: $\cos^2 t + \sin^2 t = 1$

$\sin t = \pm\sqrt{1-\cos^2 t}$ $\cos t = \pm\sqrt{1-\sin^2 t}$.

10. Use the various identities to write the first trigonometric expression in terms of the second, with terminal given by the quadrant:

a. $\sin t, \cos t$; quadrant I

$\sin t = \sqrt{1-\cos^2 t}$

b. $\tan t, \sin t$; quadrant IV tan is $(-)$

$\tan t = \frac{\sin t}{\cos t} = \boxed{\frac{\sin t}{-\sqrt{1-\sin^2 t}}}$

c. $\tan^2 t, \sin t$; any quadrant

$\tan^2 t = \frac{\sin^2 t}{\cos^2 t} = \boxed{\frac{\sin^2 t}{1-\sin^2 t}}$

d. $\csc t, \cot t$; any quadrant

$\csc t = 1 + \cot t$.

11. Find a function that models the simple harmonic motion having the given properties. Assume that the displacement is **zero** at time $t = 0$ $\Rightarrow \sin$

a. amplitude: 10 $= a$
period: $\frac{1}{2} = \frac{2\pi}{\omega} = 4\pi$.

$\boxed{y = 10 \sin 4\pi t}$

b. amplitude: 0.2
frequency: $40\pi = \frac{\omega}{2\pi} \Rightarrow \omega = 80\pi^2$

$\boxed{y = 0.2 \sin 80\pi^2 t}$

Now asume that the displacement is at its **maximum** at time $t = 0$. $\Rightarrow \cos$

c. amplitude: 135
period: $\frac{1}{70} = \frac{2\pi}{\omega} = 140\pi$

$\boxed{y = 135 \cos 140\pi t}$

d. amplitude: 0.35
frequency: $\frac{1}{4}\pi = \frac{\omega}{2\pi} \Rightarrow \omega = \frac{1}{2}\pi^2$.

$\boxed{y = 0.35 \cos \frac{\pi^2}{2} t}$

12. In a predator/prey model, the predator population is modeled by the function:

$$p(t) = 900\cos 2t + 8000$$

What is the **maximum** population? (Think! When does cos function reach the maximum?)

Cos function starts @ the maximum so, $900\cos(0) + 8000$

$= 900(1) + 8000 = \boxed{8900}$

13. Each time your heart beats, your blood pressure increases, then decreases as the heart rests between beats. A certain person's blood pressure is modeled by the function:

$$p(t) = 115 + 25\sin(160\pi t) = 25\sin(160\pi t) + 115$$

Find the amplitude, period, and frequency of p.

Amp $= 25$

per $= \frac{2\pi}{160\pi} = \frac{1}{80}$

Freq $= 80$

14. The variation of the water level relative to mean sea level in Commencement Bay at Tacoma, Washington, for a particular 24-hour period starts at mean sea level, rises to 6ft, drops 6ft below, and then returns to mean sea level. Assuming that this motion is simple harmonic:

a. Find an equation that describes the height of the tide in Commencement Bay. (Sin or cos?)

amp $= 6$

per $= 24 = \frac{2\pi}{\omega}$

$\Rightarrow \omega = \pi/12$

$$\boxed{y = 6\sin \pi/12\, t}$$

b. What is the water level at 6pm? (Think how many hours have elapsed?)

Day starts @ 12:00 am (0:00)

@ 6:00 pm it has been 18 hrs.

So, $y = 6\sin \pi/12\,(18) = 6\sin\frac{3\pi}{2} = 6(-1) = \boxed{-6 \text{ ft}}$