Group Work Unit 2
PCHA 2021-22 / Dr. Kessner

Name:

Partner(s):

You can use any materials from class, but no other online resources.
No calculator except where indicated. Have fun!

1. Evaluate the following:

a) $\sec \frac{2\pi}{3}$

b) $\csc\left(-\frac{5\pi}{6}\right)$

c) $\cos^{-1}\left(\cos \frac{2\pi}{3}\right)$

d) $\sin^{-1}\left(\sin\left(-\frac{5\pi}{6}\right)\right)$

e) $\tan^{-1}\left(\cot\left(-\frac{3\pi}{4}\right)\right)$

f) $\tan\left(\sin^{-1}\left(\cos \frac{\pi}{2}\right)\right)$

2. Write down all the relevant properties (period, amplitude, shifts/scales, asymptotes) of the following trig functions, and then graph by hand.

$f(x) = 15 - 10\sin(\frac{\pi}{8}x - \frac{\pi}{2})$

$g(x) = 3\cot(\frac{\pi}{5}x) + 2$

3. You model the motion of a spider sitting on the wheel of a stationary bike. The spider starts ($t = 0$) at the 3 o'clock position and travels clockwise with a constant angular speed, taking 6 seconds for a full revolution. The wheel's lowest point is 5cm above the ground, and it's radius is 20cm. Graph both $x(t)$ and $y(t)$. Find equations for both $x(t)$ and $y(t)$.

Calculate the position of the spider at $t = 0$, $t = 2$, $t = 3$, $t = 4$.

4. Prove the identities:
$$\frac{1}{\csc^2 x(1 - \cos x)} = 1 + \cos x$$

$$(\cot x + \tan x)^2 = \sec^2 x + \csc^2 x$$

5. Find $\sin(75°)$ using a sum angle formula.

Derive the following half angle formula from the relevant double angle formula:

$$\sin u = \pm\sqrt{\frac{1 - \cos 2u}{2}}$$

Use the half angle formula above to find $\sin(75°)$.

Challenge: Show that the two expressions you found for $\sin(75°)$ are equal.

6. Solve the following triangle. **Calculator OK**

a = 9, b = 10, A = 60°

Solve the following triangle. **No calculator!**

a = 10, b = 10, C = 60°