Unit 1 Test
PCHA 2020-21 / Dr. Kessner

No calculator, no notes – just your brain! Have fun!

1. Evaluate the following:

a) $\cos \frac{5\pi}{3}$

b) $\cot\left(-\frac{3\pi}{4}\right)$

c) $\sec \frac{5\pi}{6}$

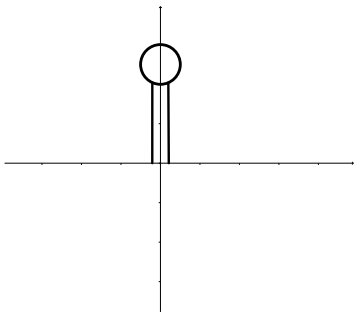
d) $\sin^{-1}\left(\sin\left(-\frac{3\pi}{4}\right)\right)$

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

f) $\cos^{-1}\left(\sin\left(\tan^{-1}(0)\right)\right)$

2. You visit the abandoned Marlborough campus, and you see a mouse at the top of the clock tower. The mouse jumps onto the second hand of the clock and rides it around. The clock needs maintenance – it takes 2 minutes for the mouse to make a full revolution. You take the opportunity to practice your trigonometry and model the mouse's motion around the clock. You estimate that the clock's radius is 1 ft. and the bottom of the clock is 7 feet above the ground. Assume that the mouse is at the top of the clock at $t = 0$ minutes.

a) Graph both $x(t)$ and $y(t)$. Find equations for both $x(t)$ and $y(t)$.



b) Calculate the position $(x(t), y(t))$ of the mouse at $t = 3$, $t = 3.5$, and $t = 4$ minutes. Make sure your answers make sense.

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

a. $f(x) = -3 + 2\cos\left(\frac{\pi}{6}x\right)$

b. $g(x) = -\tan\left(x - \frac{\pi}{2}\right)$