

## MATH 1210 TEST 2. SPRING 2016

1. Evaluate the following expressions. Simplify compound fractions. You do not have to rationalize denominators. If the value is undefined, say so.

$$\begin{aligned}\sin(\pi/3) &= \\ \cos(5\pi/4) &= \\ \sec(7\pi/6) &= \\ \tan(\pi) &= \\ \cot(\pi/6) &= \\ \csc(3\pi/4) &= \end{aligned}$$

2. Evaluate the following expressions.

$$\begin{aligned}\cos\left(\frac{\pi}{6} + \frac{\pi}{3}\right) &= \\ \cos\left(\frac{\pi}{6}\right) + \cos\left(\frac{\pi}{3}\right) &= \\ \sin\left(2 \cdot \frac{\pi}{6}\right) &= \\ 2 \sin\left(\frac{\pi}{6}\right) &= \end{aligned}$$

3. Graph the following functions. Be sure to draw at least one complete period, and to label points.

$$\begin{aligned} \text{(a)} \quad f(x) &= 2 + 2 \cos x & \text{(b)} \quad g(x) &= -3 \sin x \\ \text{(c)} \quad f(x) &= -2 \sec x & \text{(d)} \quad g(x) &= \tan(x/2) \end{aligned}$$

4. Identify the amplitude, period, and phase shift of the following functions. Then use the information to graph them.

$$\text{(a)} \quad f(x) = 3 \cos(2x)$$

$$\text{(b)} \quad f(x) = 2 \sin\left(\frac{\pi}{2}x - \frac{\pi}{4}\right)$$

5. Find the exact value of the composition. If there is no value, say “not defined”.

$$\text{(a)} \quad \sin(\sin^{-1}(3))$$

$$\text{(b)} \quad \cos(\cos^{-1}(1/2))$$

$$\text{(c)} \quad \tan(\tan^{-1}(2\pi))$$

$$\text{(d)} \quad \cos^{-1}(\cos(2\pi/3))$$

$$\text{(e)} \quad \sin^{-1}(\sin(\pi/4))$$

$$\text{(f)} \quad \tan^{-1}(\tan(3\pi/4))$$

6. Find the exact value of the composition.

$$\text{(a)} \quad \sin(\cos^{-1}(\sqrt{3}/2))$$

$$\text{(b)} \quad \cos(\sin^{-1}(1))$$

$$\text{(c)} \quad \sin(\tan^{-1}(-\sqrt{3}))$$

$$\text{(d)} \quad \sin(\cos^{-1}(1/3))$$

$$\text{(e)} \quad \sec(\tan^{-1}(2))$$

7. Write the trigonometric expression as an algebraic expression in  $u$ .

$$\text{(a)} \quad \sin(\tan^{-1}(u))$$

$$\text{(b)} \quad \sec(\sin^{-1}(u))$$

SOLUTIONS

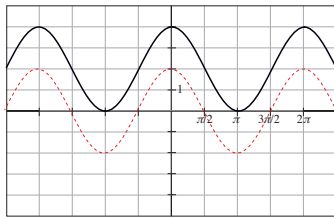
1.

$$\begin{aligned}\sin(\pi/3) &= \sqrt{3}/2 \\ \cos(5\pi/4) &= -\sqrt{2}/2 \\ \sec(7\pi/6) &= -2/\sqrt{3} \\ \tan(\pi) &= 0 \\ \cot(\pi/6) &= \sqrt{3} \\ \csc(3\pi/4) &= \sqrt{2}\end{aligned}$$

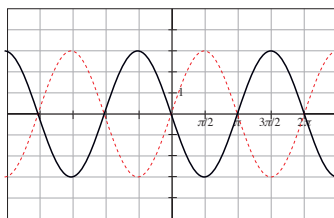
2.

$$\begin{aligned}\cos\left(\frac{\pi}{6} + \frac{\pi}{3}\right) &= \cos(\pi/2) = 0 \\ \cos\left(\frac{\pi}{6}\right) + \cos\left(\frac{\pi}{3}\right) &= \frac{\sqrt{3}}{2} + \frac{1}{2} = \frac{1 + \sqrt{3}}{2} \\ \sin\left(2 \cdot \frac{\pi}{6}\right) &= \sin(\pi/3) = \sqrt{3}/2 \\ 2 \sin\left(\frac{\pi}{6}\right) &= 2(1/2) = 1\end{aligned}$$

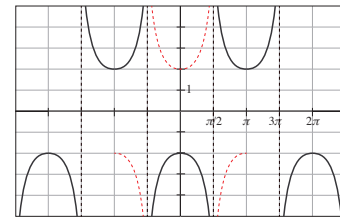
3.



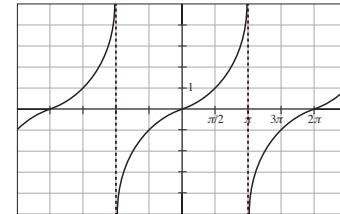
(a)



(b)

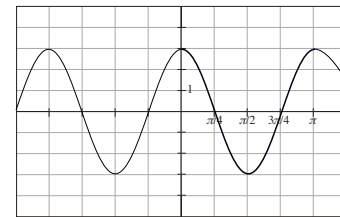


(c)



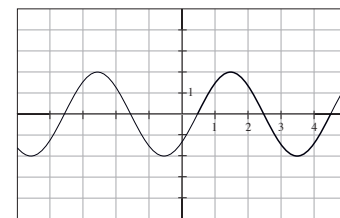
(d)

4. (a) Amplitude: 3, Period:  $\pi$ , Phase shift: 0



(a)

(b) Amplitude: 2, Period: 4, Phase shift: 1/2



(b)

5. (a)  $\sin(\sin^{-1}(3)) = \text{not defined}$

(b)  $\cos(\cos^{-1}(1/2)) = 1/2$

(c)  $\tan(\tan^{-1}(2\pi)) = 2\pi$

(d)  $\cos^{-1}(\cos(2\pi/3)) = 2\pi/3$

(e)  $\sin^{-1}(\sin(\pi/4)) = \pi/4$

(f)  $\tan^{-1}(\tan(3\pi/4)) = -\pi/4$

6. (a)  $\sin(\cos^{-1}(\sqrt{3}/2)) = \sin(\pi/6) = 1/2$

(b)  $\cos(\sin^{-1}(1)) = \cos(\pi/2) = 0$

(c)  $\sin(\tan^{-1}(-\sqrt{3})) = \sin(-\pi/3) = -\sqrt{3}/2$

(d) Draw a right triangle with adjacent side 1 and hypotenuse 3. The opposite side is  $\sqrt{8}$  so

$$\sin(\cos^{-1}(1/3)) = \sqrt{8}/3$$

(e) Draw a right triangle with opposite side 2 and adjacent side 1. The hypotenuse is  $\sqrt{5}$  so

$$\sec(\tan^{-1}(2)) = \sqrt{5}$$

7. (a) Draw a right triangle with opposite side  $u$ , adjacent side 1. The hypotenuse is  $\sqrt{1+u^2}$ , so

$$\sin(\tan^{-1}(u)) = \frac{u}{\sqrt{1+u^2}}$$

(b) Draw a right triangle with opposite side  $u$  and hypotenuse 1. The adjacent side is  $\sqrt{1-u^2}$ , so

$$\sec(\sin^{-1}(u)) = \frac{1}{\sqrt{1-u^2}}$$