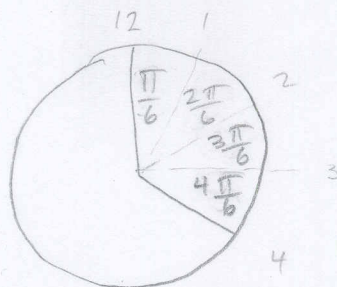


Math 144  
Practice Exam Chap 7

1. When a clock reads 4:00, what is the radian measure of the smaller angle between the hands? (give an exact result).



$$\frac{4\pi}{6} = \boxed{\frac{2\pi}{3}}$$

2. Convert  $3\pi/5$  to degrees.

$$\frac{3\pi \text{ rad}}{5} \times \frac{180^\circ}{\pi \text{ rad}} = \boxed{108^\circ}$$

4. Find the exact values of  $\sin \pi/3$ , and  $\tan 11\pi/6$ .

$$\frac{\sqrt{3}}{2}, \quad -\frac{\sqrt{3}}{3}$$

Quadrant I                      Quadrant II

5. If  $\tan \alpha = 2/3$  and  $\cos \alpha < 0$  compute sine  $\alpha$ .

$$\cot^2 \alpha + 1 = \csc^2 \alpha$$

$$\frac{1}{\tan^2 \alpha} + 1 = \frac{1}{\sin^2 \alpha}$$

$$\frac{1}{\left(\frac{2}{3}\right)^2} + 1 = \frac{1}{\sin^2 \alpha}$$

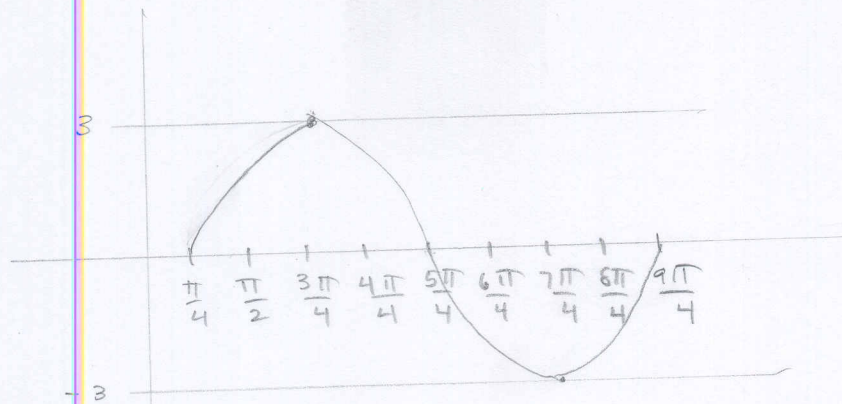
$$\left(\frac{3}{2}\right)^2 + 1 = \frac{1}{\sin^2 \alpha}$$

$$\frac{9}{4} + \frac{4}{4} = \frac{1}{\sin^2 \alpha}$$

$$\sqrt{\frac{13}{4}} = \frac{1}{\sin^2 \alpha} \Rightarrow \sin \alpha = \sqrt{\frac{4}{13}} = \boxed{-\frac{2}{\sqrt{13}}}$$

this is in Quadrant 3 because  $\cos < 0$  and  $\tan \alpha$  is positive. This is why there is a negative sign on the answer.

6. Graph one period for  $y = 3 \sin(x - \pi/4)$ . List x-intercepts and turning points.



x-intercept =  $\frac{\pi}{4}, \frac{5\pi}{4}, \frac{9\pi}{4}$   
 turning points  $(\frac{3\pi}{4}, 3)$   $(\frac{7\pi}{4}, -3)$

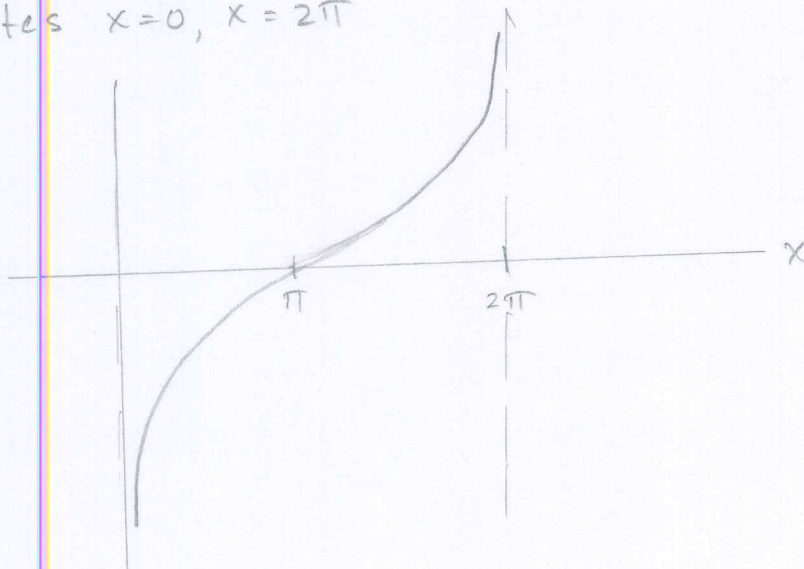
7. Graph one period for  $y = -1/2 \cot(x/2)$

$$A = \frac{1}{2}$$

$$P = \frac{\pi}{\frac{1}{2}} = 2\pi$$

asymptotes  $x=0, x=2\pi$

Cot is reflection of tan graph  
 $P = \pi$   
 $x = \text{intercepts } \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}$



8. Find the amplitude, period, and phase shift for  $y = 3/8 \cos(2x - \pi/4)$ .

$$y = A \cos(Bx - C)$$

$$= \frac{3}{8} \quad 2 \quad \frac{\pi}{4}$$

Amplitude =  $\boxed{\frac{3}{8}}$

$P = \frac{2\pi}{B} = \frac{2\pi}{2} = \boxed{\pi}$

Phase shift =  $\frac{C}{B} = \frac{\pi/4}{2} = \boxed{\frac{\pi}{8}}$

9. Which of the following functions are even? There may be more than one.

a.  $y = \sin^2 x$

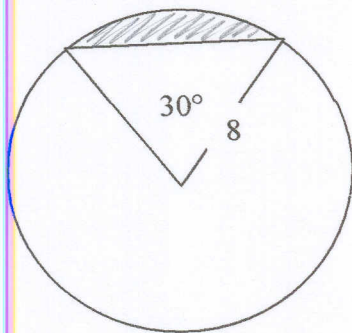
b.  $y = 4 \sin x \cos x$

c.  $y = \cos^3 x$

d.  $y = \tan x$

e.  $y = \sin^3 x$

10. Find the area of the shaded segment shown below. Give an exact result.



Segment (sector) area =  $\frac{1}{2} r^2 \theta$   
 triangle area =  $\frac{1}{2} (a)(b) \sin \theta$

Sector - triangle = shaded area

$$\frac{1}{2} r^2 \frac{\pi}{6} - \frac{1}{2} r^2 \sin \frac{\pi}{6}$$

$$\frac{1}{2} r^2 \left( \frac{\pi}{6} - \frac{1}{2} \right)$$

$$\frac{1}{2} 8^2 \left( \frac{\pi}{6} - \frac{1}{2} \right)$$

$$\frac{1}{2} 64 \left( \frac{\pi}{6} - \frac{1}{2} \right)$$

$$= 32 \left( \frac{\pi}{6} - \frac{1}{2} \right)$$

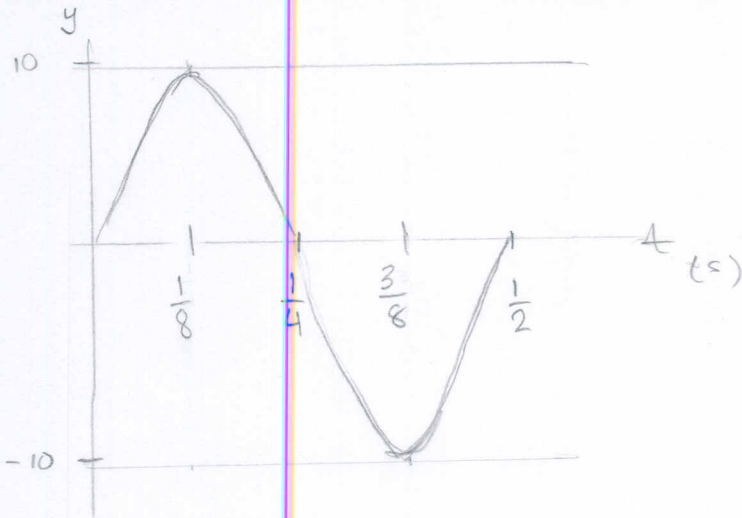
11. A mass is suspended from a spring and can be modeled by the function  $y = 10 \sin 4\pi t$ . Find  
 (a) the amplitude, period, and frequency of the motion of the mass;

$$A = \boxed{10}$$

$$P = \frac{2\pi}{4\pi} = \boxed{\frac{1}{2}}$$

$$f = \frac{1}{P} = \boxed{2}$$

- (b) sketch the graph of the displacement of the mass;



- (c) what is the minimum amount of time that passes (after  $t = 0$ ) before the  $y$  coordinate is zero;

$$\frac{1}{4} \text{ sec}$$

- (d) at what time (after  $t = 0$ ) is the minimum amount of time that passes for the  $y$ -coordinate to be  $-10$ ?

$$\frac{3}{8} \text{ s}$$

12. Find all solutions to  $\cos(x) = \frac{0.7}{0.8}$  in the interval  $0 < x < 2\pi$  (give your answer(s) accurate to 4 decimal places)

$$x = \cos^{-1} 0.7 = \boxed{0.7959}$$

$$2\pi - x = 2\pi - 0.7959 = \boxed{5.4878}$$

← located in Quadrant I or Quadrant IV because number is positive