

November 14, 2003

Give complete explanations, not just answers, for full credit. **Give exact answers whenever possible, otherwise give answers accurate to two decimal places.** Sketch any calculator graph you use including the axes with a scale.

1. (16 pts) Give the exact value of the following trigonometrical expressions:

(a) $\cos\left(\frac{\pi}{3}\right)$ (b) $\sec\left(-\frac{\pi}{4}\right)$ (c) $\tan^{-1}(1)$ (d) $\sec(-7\pi)$ (e) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$.

2. (12 pts) If $\cos(t) = \frac{2}{3}$ and $-\frac{\pi}{2} < t < \frac{\pi}{2}$, find $\tan(t)$.

3. (12 pts) Which of the following statements are true for all values of x ? Which are false? Briefly explain your reason for each TRUE or FALSE answer.

(a) $\sin^2(x) + \cos^2(x) = 1$

(b) $\frac{\sin(x)}{\cos(-x)} = \tan(x)$

(c) $\sin(\pi + x) = -\sin(x)$

(d) $\sin\left(\frac{\pi}{2} + x\right) = \cos x$

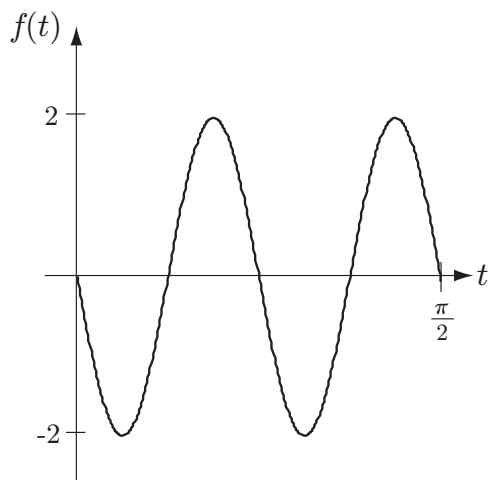
4. (12 pts) Find an algebraic expression in v for the expression $\tan(\sin^{-1} v)$.

5. (12 pts) Use your knowledge of special values to find all of the solutions of the equation $\cos(2x) = \frac{1}{2}$. (Give exact answers for full credit.)

There are more questions on the reverse side.

6. (12 pts) The graph of a function that describes a simple harmonic motion is shown below.

- (a) What is the amplitude of the function?
- (b) What is the period of the function?
- (c) What is a possible formula for the function?



7. (12 pts) The function $h(t)$ models the height in feet at time t seconds of a rider on a Ferris wheel.

$$h(t) = -16 \cos\left(\frac{\pi t}{40}\right) + 24$$

- (a) What is the maximum height the rider reaches?
 - (b) How long does it take for one revolution of the wheel?
 - (c) How high is the rider when $t=50$ seconds?
 - (d) When is the first time, after $t = 0$, the rider reaches a height of 24 feet?
8. (12 pts) A riding lawnmower has wheels that are 12 inches in diameter. If the lawnmower is traveling 3 miles per hour, what is the angular speed of the wheels in radians per second?
(1 mile = 5280 feet; 1 foot = 12 inches)