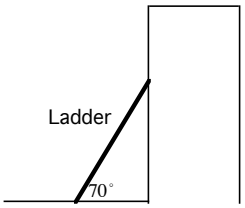
Trigonometry Problems Names:_____

Show all relevant work!

1. If a fireman leans a 24 foot ladder against a building at a 70° angle,

(a) How far from the building is the base of the ladder?



(b) How high (above the ground) does the ladder reach on the building?

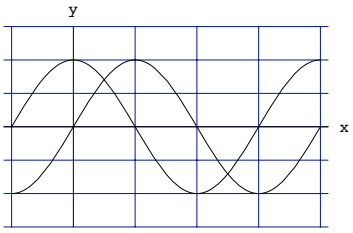
2. A merry-go-round with a 10 ft. diameter is spinning at 12rpm.

(a) What is the angular velocity of the merry-go-round in radians per second?

(b) How fast (in feet per second) is Raul travelling if he sits on the outer edge of the merry-go-round?

(c) How fast is Klaus travelling (in feet per second) if he sits at the center of the merry-go-round?

3. The functions $\sin x$ and $\cos x$ are almost identical except for horizontal position (see below). That means you should be able to express $\sin x$ as a shift of $\cos x$ and similarly, $\cos x$ as a shift of $\sin x$. Specifically, find c so that $\sin x = \cos(x + c)$ and find c so that $\cos x = \sin(x + c)$.



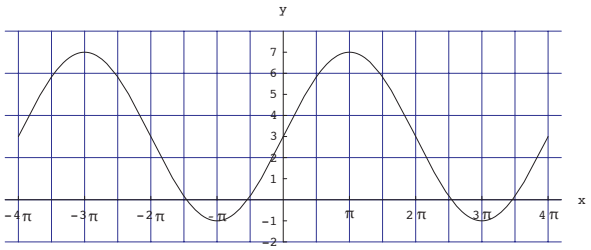
4. Solve the following for $x \in \mathbb{R}$.

(a) $\sin x = 1$

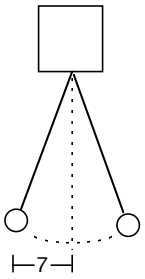
(b) $\cos 3x = 1$

(c) $\sin(x^2 - 1) = 1$

5. Find two different equations for the periodic function shown on the right. (One in terms of $\sin x$ and the other in terms of $\cos x$).



6. A pendulum on a clock keeps time by swinging and clicking the second hand gear. The pendulum begins displaced 7 cm from center and swings to the other extreme in 1 second (and back in one second and so on). Write a periodic equation for the pendulum's displacement from center as a function of time.



7. The table below shows the US average unemployment rate at the beginning of each year from 1993 – 2003. (Where 1993 is $t = 0$).

t (years)	0	1	2	3	4	5	6	7	8	9	10
$U(t)$ (% unemployment)	7.3	6.6	5.6	5.6	5.3	4.6	4.3	4.0	4.1	5.6	5.7

a) Write a periodic function that models these data using methods discussed in class.

b) Use your model to predict the unemployment rate for January of 2006.