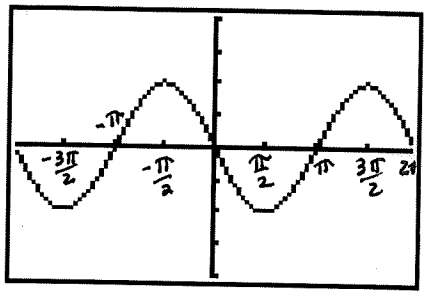
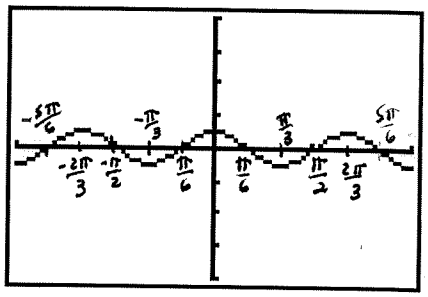
TRIGONOMETRY WORKSHEET
Writing Equations of Graphs

Write the equation of each of the following graphs.

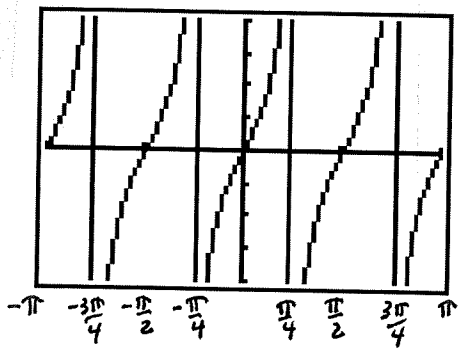
1. sin



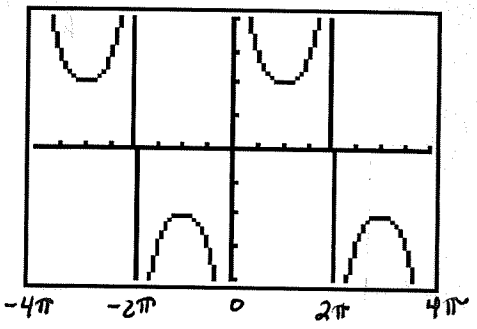
2. cos



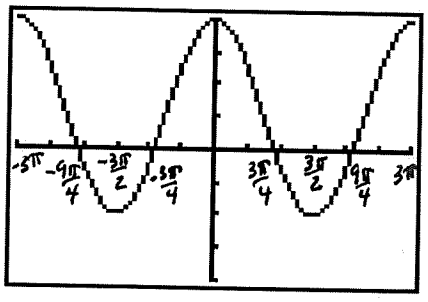
3. tan



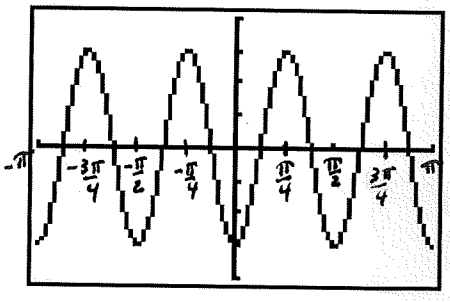
4. sec



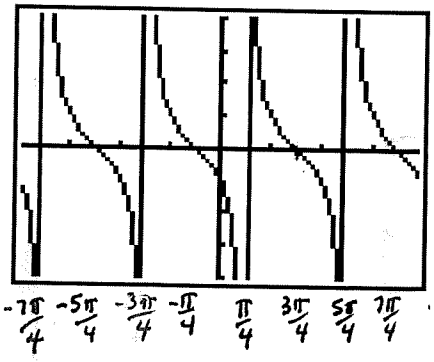
5. sin



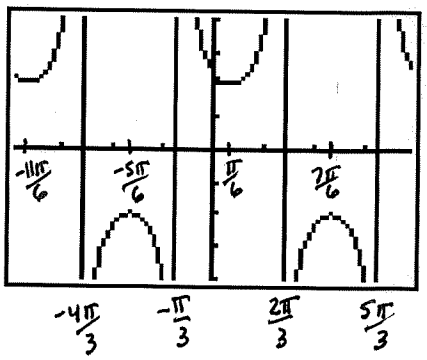
6. cos



7. cot



8. csc



ANSWERS

1. $y = -2\sin x$ or $y = 2\sin(x-\pi)$ or $y = 2\sin(x+\pi)$

2. $y = \frac{1}{2}\cos 3x$

3. $y = 2\tan 2x$

4. $y = 2\sec\frac{1}{2}(x-\pi)$ OR $y = 2\sec\frac{1}{2}(x+3\pi)$ OR $y = -2\sec\frac{1}{2}(x+\pi)$

5. $y = 3\sin\frac{2}{3}\left(x+\frac{3\pi}{4}\right)+1$ OR $y = -3\sin\frac{2}{3}\left(x-\frac{3\pi}{4}\right)+1$

6. $y = 3\cos 4\left(x+\frac{\pi}{4}\right)$ or $y = 3\cos 4\left(x-\frac{\pi}{4}\right)$ or $y = -3\cos 4x$

7. $y = \cot\left(x+\frac{3\pi}{4}\right)$ or $y = \cot\left(x-\frac{\pi}{4}\right)$

8. $y = 2\csc\left(x+\frac{\pi}{3}\right)$ or $y = -2\csc\left(x-\frac{2\pi}{3}\right)$

TRIGONOMETRY HANDOUT
APPLICATIONS OF TRIGONOMETRIC GRAPHS

Use your knowledge of sinusoidal motion to answer the following questions. *HINT: Drawing a graph of the situation often helps!*

1. The temperature T of a patient during an illness is given by $T(t) = 101.6° + 3° \sin\left(\frac{\pi}{4}t\right)$.
   (a) Draw a rough sketch of the patient's temperature during the illness. Label the x- and y-axis.
   (b) How many days does the illness last until the temperature returns to a normal 98.6°?
   (c) What is the highest temperature experienced by the patient?

2. In predator-prey systems, the number of predators and the number of prey tend to vary periodically. In a certain region with coyotes as predators and rabbits as prey, the rabbit population R varied according to the formula $R = 1000 + 150 \sin\left(\frac{\pi}{2}t\right)$ where t was measured in years after January 1, 2000.
   (a) What are the minimum and maximum rabbit populations?
   (b) How many years are between peak rabbit populations?
   (c) When was the minimum population first reached?
   (d) What will the population be on Jan. 1, 2014?

3. The voltage drop E across the terminals in a certain alternating current circuit is approximately $E = 156 \sin(110\pi t)$, where t is in seconds.
   (a) What is the maximum voltage drop?
   (b) What is the frequency (number of cycles per second)?

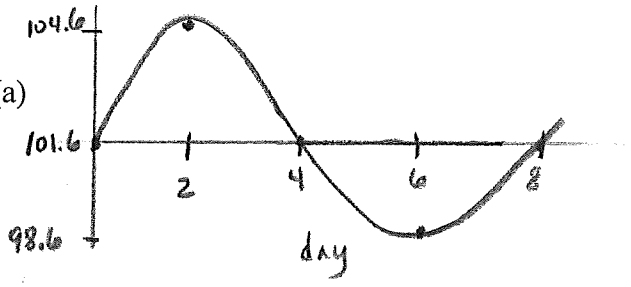
4. On a cold winter day, a house is heated until it is warm enough for the thermostat to turn off the heat. Then the house cools until it is cool enough for the thermostat to turn on the heat again. Assume that this periodic change in temperature can be modeled by a cosine function.
   (a) Find an equation of this function H with time t expressed in hours given the following data:
   - The thermostat turns heat on at 10:15 a.m. when the house temperature is 68°F.
   - The thermostat turn heat off at 10:30 a.m. when the house temperature is 72°F.

   (b) Why might a trigonometric function not be a good model in this situation?

5. According to the Old Farmer's Almanac, in Seneca, KS the number of hours of sunlight on the day of the summer solstice (172^{nd} day of the year) is 15.02 and the number of hours of sunlight on the day of the winter solstice is 9.22.
   (a) Find a cosine equation for this data.
   (b) Use the function to predict the number of hours of sunlight on April 1, the 91^{st} day of the year to the nearest hundredth.

ANSWERS

1. (a)



(b) 6 days *(Note: How many days to reach the bottom point on the curve, not the whole period.)*

(c) 104.6°

2. (a) 850: 1150 (b) 4 (c) January 1, 2003 (d) 1000
3. (a) 156 (b) 55
4. (a) $H = 2\cos 4\pi\left(t - 10.5\right) + 70$ (b) A furnace would heat the room more quickly than the natural cooling of the room would occur.
5. (a) $y = 2.9\cos\left(\frac{2\pi}{365}\left(x - 172\right)\right) + 12.12$ (b) 12.63 hours