19 Introduction to Trigonometry Worksheet

Concepts:

- The Trigonometric Functions
  - The Definitions of sin, cos, and tan Based on the Unit Circle
  - Evaluating the Basic Trigonometric Functions at Special Angles
  - The Sign of a Trigonometric Function
- The $\frac{\pi}{4} - \frac{\pi}{4} - \frac{\pi}{2}$ or the $45° - 45° - 90°$ Triangle
- The $\frac{\pi}{6} - \frac{\pi}{3} - \frac{\pi}{2}$ or the $30° - 60° - 90°$ Triangle
- Approximating Values of Trigonometric Functions with Your Calculator
  - Parentheses Are Important
  - Radian Mode vs. Degree Mode
- Understanding Trigonometric Notation
- The Graph of the sin, cos, and tan Functions
- Applying Graph Transformations to the Graphs of the sin, cos, and tan Functions
- Using Graphical Evidence to Make Conjectures about Identities

(**Sections 6.2 & 6.4**)

1. Evaluate the basic trigonometric functions at each of the following angles.
   (a) $\theta = \dfrac{\pi}{3}$
   (b) $\theta = -\dfrac{9\pi}{4}$
   (c) $\theta = 4\pi$
   (d) $\theta = \dfrac{17\pi}{6}$

2. (a) The terminal side of an angle, θ, in standard position contains the point $(-5, 9)$. Evaluate the basic trigonometric functions at θ.
   (b) The terminal side of an angle, θ, in standard position contains the point $(11, 4)$. Evaluate the basic trigonometric functions at θ.

3. Suppose θ is in the fourth quadrant and $\cos(\theta) = \dfrac{1}{5}$. Evaluate the remaining basic trigonometric functions on θ.

4. Suppose θ is in the first quadrant and $\sin(\theta) = \frac{6}{7}$. Find each of the following (give exact answers):

   (a) $\sin(8\pi + \theta)$

   (b) $\tan(-\theta)$

   (c) $\cos(4\pi - \theta)$

5. For each of the following equations, list the transformations that you need to apply to the graph of $y = \sin(x)$, $y = \cos(x)$, or $y = \tan(x)$ to sketch the graph of the equation. Sketch the graph. Be sure that the graph is well-labeled.

   (a) $y = 4\sin(3x)$

   (b) $y = 3\cos\left(\frac{x}{\pi}\right)$

   (c) $y = 2\sin\left(x - \frac{\pi}{3}\right)$

   (d) $y = -\tan\left(x + \frac{\pi}{4}\right)$

   (e) $y = u\cos(vx + w)$. (Assume that u, v, and w are positive.)

6. Use graphical evidence to determine which of the following **MIGHT** be trigonometric identities and which definitely cannot be trigonometric identities.

   (a) $\cos(2x) = \cos^2(x) - \sin^2(x)$

   (b) $\sin(2x) = \sin^2(x) - \cos^2(x)$

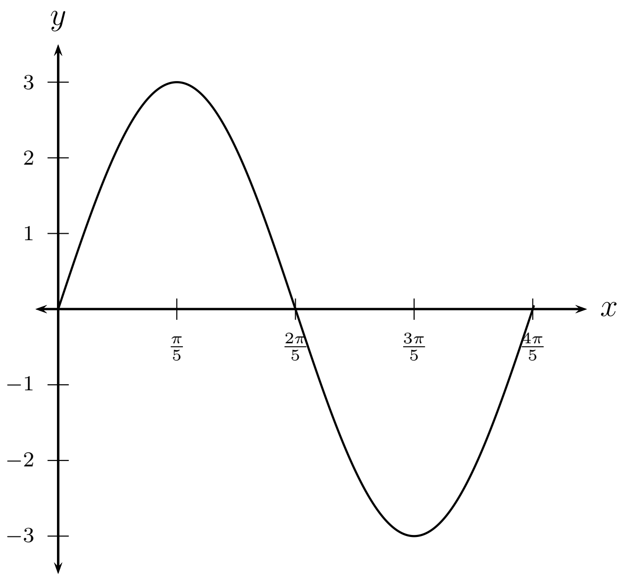
   (c) $\sin(x + y) = \sin(x) + \sin(y)$

   (d) $\sin(x)\cos(y) = \frac{1}{2}(\sin(x + y) + \sin(x - y))$

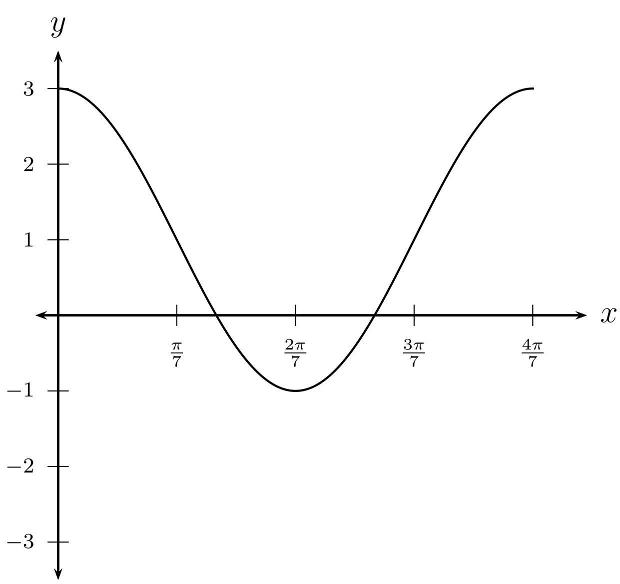
   (e) $\tan(xy) = \tan(x)\tan(y)$

   (f) $\frac{\sin(t^2)}{t} = \sin(t)$

7. The graph of a periodic function is shown below. Find a rule for the function.



8. The graph of a periodic function is shown below. Find a rule for the function.



9. (Question 43 from Section 6.5 of your textbook)

   Burke's blood pressure can be modeled by the function

   $$g(t) = 21\cos(2.5\pi t) + 113,$$

   where t is the time (in seconds) and $f(t)$ is in millimeters of mercury. The highest pressure (systolic) occurs when the heart beats, and the lowest pressure (diastolic) occurs when the heart is at rest between beats. The blood pressure is the ratio systolic/diastolic.

   (a) Graph the blood pressure function over a period of two seconds and determine Burke's blood pressure.

   (b) Find Burke's pulse rate (number of heartbeats per minute).

   (c) According to current guidelines, someone with systolic pressure above 140 or diastolic pressure above 90 has high blood pressure and should see a doctor about it. What would you advise the person in this case?

10. (Question 47 from Section 6.5 of your textbook)

    The current generated by an AM radio transmitter is given by a function of the form $f(t) = A\sin(2000\pi m t)$, where $550 \leq m \leq 1600$ is the location on the broadcast dial and t is measured in seconds. For example, a station at 980 on the AM dial has a function of the form

    $$f(t) = A\sin(2000\pi(980)t) = A\sin(1960000\pi t).$$

    Sound information is added to this signal by varying (modulating) A, that is, by changing the amplitude of the waves being transmitted. (*AM* means "amplitude modulation.") For a station at 980 on the dial, what is the period of the function f? What is the frequency (number of complete waves per second)?

11. (Question 48 from Section 6.5 of your textbook)

    The number of hours of daylight in Winnipeg, Manitoba, can be approximated by

    $$d(t) = 4.15\sin(.0172t - 1.377) + 12,$$

    where t is measured in days, with $t = 1$ being January 1.

    (a) On what day is there the most daylight? The least? How much daylight is there on these days?

    (b) On which days are there 11 hours or more of daylight? What do you think the period of this function is? Why?