

## Exercises

- Given  $y = \sin x$ , what is its period?
  - Given  $y = \cos x$ , what is its period?
  - Given  $y = \tan x$ , what is its period?
  - Knowing the above periods, what are the periods of  $y = \sec x$ ,  $y = \csc x$  and  $y = \cot x$ ?
- In comparison to the basic graphs which **phase shift** does each of the following have - right, left, none?
  - $y = \sin(x - \pi)$
  - $y = \cos(2x + \pi/2)$
  - $y = 5 \tan x$
  - $y = -\sec x$
  - $y = \csc x + 5$
  - $y = -\sin(1/2x + \pi)$
- Determine the period, amplitude and phase shift for each of the following.
  - $y = 3 \sin x$
  - $y = -5 \cos(2x)$
  - $y = 4 \tan 3x$
  - $y = 2 \cos(x + \pi)$
  - $y = -1/2 \sin(2x - 10^\circ)$
  - $y = \cot(1/2 x + \pi)$
  - $y = .25 \cos(.25x + .25) + .25$
- Which period is larger?
  - $\sin x$  or  $\sin 1/2x$  ?
  - $\cos 2x$  or  $\cos x$  ?
  - $\tan 1/3 x$  or  $\cot 3x$  ?
  - $\cos 2x$  or  $\sin 2x$  ?
  - $\tan 2x$  or  $\sin 2x$  ?
  - $\sec x$  or  $\cot 1/2x$  ?
- On the coordinate system below, graph the functions **without** a graphing calculator or computer. Graph **two** periods, using both degrees and radians for your scale.

a.  $y = \sin x$



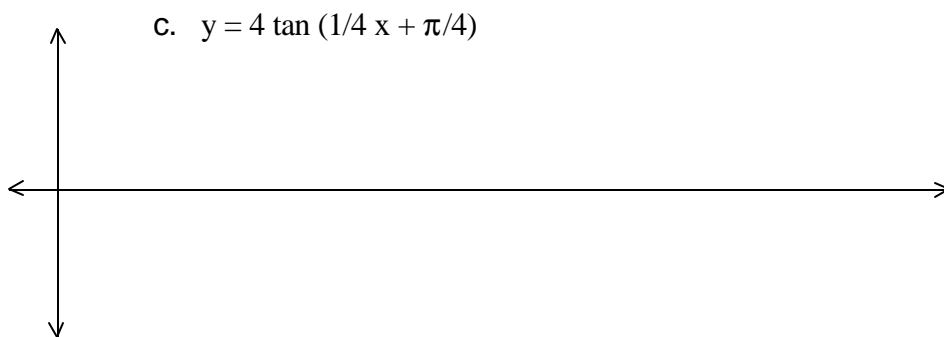
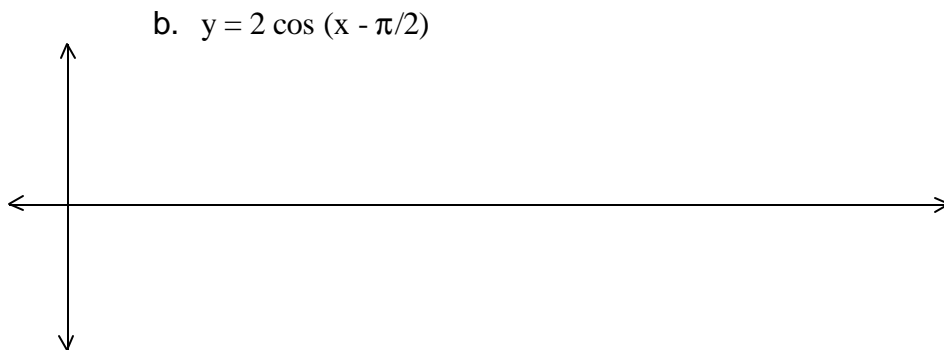
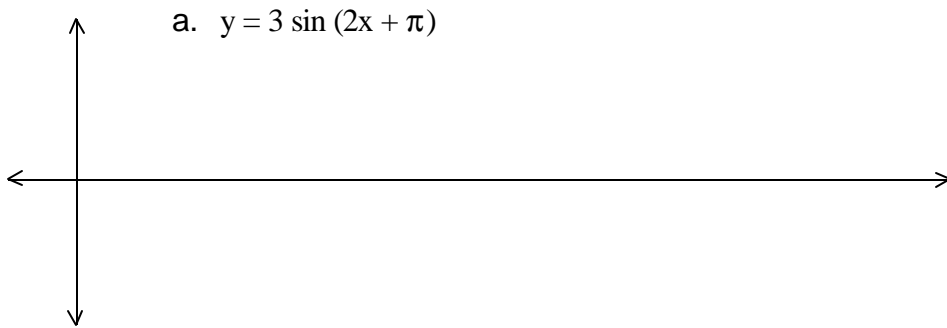
b.  $y = \cos x$



c.  $y = \tan x$



6. Using the fact that secant is the reciprocal of cosine, cosecant is the reciprocal of sine and cotangent is the reciprocal of tangent, graph:
- $y = \csc x$  on the same graph as  $y = \sin x$  above.
  - $y = \sec x$  on the same graph as  $y = \cos x$  above.
  - $y = \cot x$  on the same graph as  $y = \tan x$  above.
7. Using your knowledge of amplitude, period and phase shift graph the following **without** a graphing calculator or computer:



8. a. If the amplitude of a periodic function is 4, the period is  $\pi$  and the phase shift is  $1/4 \pi$  to the right, express the function in the form of  $y = A \sin(B x + C)$ .

b. If the amplitude is  $1/2$ , the function is reflected over the x-axis, the period is  $1/3 \pi$ , and the phase shift is 2 to the left, express the function in the form of  $y = A \sin(B x + C)$ .

9. True or false:

a.  $y = \sin x$  should be shifted  $\pi/2$  to the right to obtain  $y = \cos x$ .

b.  $y = \cot x$  should be shifted  $\pi/2$  to the left to obtain  $y = \tan x$ .

- c.  $y = \sec x$  should be shifted  $\pi/2$  to the left to obtain  $y = \csc x$ .
- d.  $y = \sin x$  is the same as  $y = -\sin(-x)$ .
- e.  $y = \cos x$  is the same as  $y = -\cos x$ .
- f.  $y = \tan x$  is the same as  $y = \tan(-x)$ .

10. From the lesson on harmonic traveling waves state the relationship (in words or mathematically) between each of the following:

- a. period of a sine wave and wavelength of a harmonic wave.
- b. period of a sine wave and the wave number of a harmonic wave.
- c. frequency, velocity and wavelength of a harmonic wave.
- d. wave length and angular frequency of a harmonic wave.
- e. frequency and angular frequency of a harmonic wave.

11. a. What is the relationship between the length of a sound wave and its tone?

b. What is the relationship between the amplitude of a sound wave and its tone?

12. Using the words:

sound source, medium, receiver, amplitude, wavelength, frequency, resonance timber, and overtones,

write a paragraph about sound waves.

13. a. Describe the difference between sound waves and carrier waves.

b. Describe the difference between AM bands and FM bands.

c. Describe how a short wave travels; state its frequency range and its uses.

d. Describe how a medium wave travels; state its frequency range and its uses.

e. Describe how a long wave travels; state its frequency range and its uses.

f. Describe how a very high frequency wave travels; state its frequency range and its uses.

14. Put the following terms for AM broadcasting in order, and describe what each does:

receiver, modulator, demodulator, transmitter, broadcast, listener

15. What are the regions of the electromagnetic spectrum?
16. In what region of the electromagnetic spectrum is visible light?
17. How is white light produced?
18. What is the speed of light?
19. What are lasers?