Lab on Sine Wave Geometry

1. Class picture (0.5 point)

Refer to lab page 1. What is the circumference of the circle on the left?

a. 1 b. 2 c. $\pi/2$ d. π e. 2π

2. Class picture (0.5 point)

Refer to lab page 1. Set the applet to display the sine curve. The circle on the left has axes labeled with x and y, and the sine curve on the right has axes labeled with x and y. How does this assignment of variables compare with the labels used in class?

a. x measures the same thing left and right, but y measures something different.
b. y measures the same thing left and right, but x measures something different.
c. x and y both measure the same thing left and right.
d. x and y both measure something different left and right.

3. How to compute. (1 point)

Refer to lab page 2. Interpreting geometric quantities in this sketch numerically, describe how you would compute the value of the sine function for a given position of X.

a. Divide the length of the time axis by the radius of the yellow circle.
b. Multiply the height of the red line by the radius of the yellow circle.
c. Multiply the length of the time axis by the radius of the yellow circle.
d. Divide the height of the red line by the radius of the yellow circle.
e. Divide the radius of the yellow circle by the height of the red line.

4. Speed of X. (1 point)

Refer to lab page 2. Change the radius of the yellow circle while X is rotating. How does the speed of X change as the radius decreases? (As a hint, the angular speed could be measured in radians per second, and the linear speed could be measured in feet per second.)

a. The angular speed increases and the linear speed increases.
b. The angular speed stays the same and the linear speed increases.
c. The angular speed increases and the linear speed stays the same.
d. The angular speed and the linear speed stay the same.

5. Radius and shape of curve (1 point)

Refer to lab page 2. Make X rotate and time progress. Now drag the red point on the circumference to change the radius of the yellow circle. How does the shape of the sinusoidal curve change when the radius of the yellow circle gets smaller?

a. The amplitude decreases and the period decreases.
b. The amplitude decreases and the period stays the same.
c. The amplitude decreases and the period increases.
d. The amplitude stays the same and the period decreases.
e. The amplitude stays the same and the period stays the same.
f. The amplitude stays the same and the period increases.
g. The amplitude increases and the period decreases.
h. The amplitude increases and the period stays the same.
i. The amplitude increases and the period increases.

6. Change time axis length. (1 point)

Refer to lab page 2. Notice, when time reaches the end of its axis, that it starts a new sine wave in a different place than the sine wave it just finished plotting. Put the yellow circle back to its original radius (use the reset button in the menu bar). Change the length of the time axis by dragging the right hand end point so that it only produces one sine wave, no matter how long the points kept moving. You probably won't be able to get it just right, but you should be able to come close. What length works, to the nearest unit? Write down the time axis length and the circle radius for this problem--you will need them later.
a. 221 b. 228 c. 235 d. 242 e. 262

7. Radius change (1 point)

Refer to lab page 2. Reset the picture to its original dimensions, and this time change the radius of the yellow circle so that it only produces one sine wave, no matter how long the points keep moving. What radius works, to the nearest unit?
a. 46 b. 51 c. 56 d. 61 e. 66 f. 71

8. LengthRadius ratio (1 points)

Refer to lab page 2. What do you notice about the ratio of the length of the time axis to the circle radius in questions 5 and 6?

a. They are the same--about $\sqrt{5}$
b. They are the same--about π
c. They are the same--about $\sqrt{2}$ $\sqrt{3}$
d. They are the same--about 2π
e. They are the same--about 8.5

9. Double circumference (0.5 point)

Refer to lab page 2. What happens when you set the time axis to be double the circumference of the yellow circle?

a. There is time for one period on the time axis.
b. There is time for two periods on the time axis.
c. The curve is shaped like the letter o.
d. The curve is shaped like the letter n.
e. The curve is shaped like the letter x.

10. Radius and shape of curve 2 (0.5 point)

Refer to lab page 3. What happens to the sinusoidal curve in the second figure when the radius of the green circle decreases? (To change the radius you have to Show the hidden parts of the construction. The radius is controlled by a red dot hidden at the bottom of the circle, at about 270^{o}.)
a. The amplitude decreases and the period decreases.
b. The amplitude decreases and the period stays the same.
c. The amplitude decreases and the period increases.
d. The amplitude stays the same and the period decreases.
e. The amplitude stays the same and the period stays the same.
f. The amplitude stays the same and the period increases.
g. The amplitude increases and the period decreases.
h. The amplitude increases and the period stays the same.
i. The amplitude increases and the period increases.

11. Essay (2 points)

Refer to lab page 3. Show the points in the underlying construction. Describe how you could move a particular red point to change the amplitude of the sinusoidal curve, and how you could change the period.