AP Precalculus

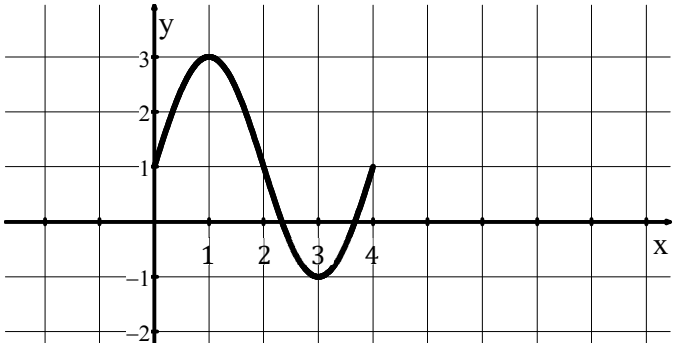
Name: _____ Date:_____

Corrective Assignment

Unit 3A CA – Trigonometric and Polar Functions

1.

a. The graph below shows one period of a periodic function. Sketch the rest of the graph on the given axes.

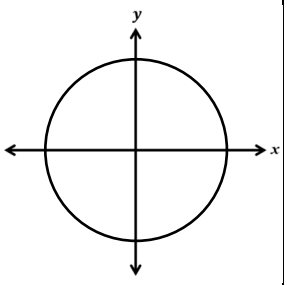


b. Is the function concave up, concave down, or both on the interval $42 < x < 44$?

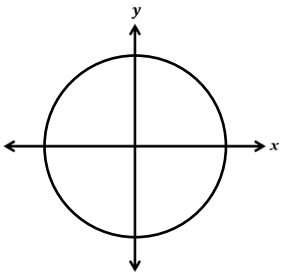
2. An angle in standard position with a measure of -7.2π would have a terminal ray in which quadrant?

Below are various measurements of a circle's radius, an angle within the circle, or the arc subtended by the angle. SKETCH the approximate angle on the axes and find the missing value.

3. Radius is 9.4 and the length of an arc subtended by an angle is 42.7. Find the measure of the angle.



4. Radius is 1.26 and an angle is 4.05 radians. Find the length of the arc subtended by the angle.

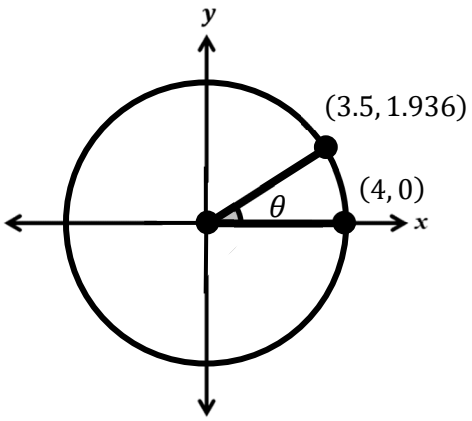


Find the value of each expression. Try not to look back at the Unit Circle for help.

5. $\sin(-\pi)$	6. $\cos\frac{\pi}{6}$	7. $\sin\frac{5\pi}{3}$	8. $\cos\frac{11\pi}{6}$	9. $\cos\left(-\frac{5\pi}{6}\right)$	10. $\sin\left(-\frac{3\pi}{4}\right)$

Each figure below gives a circle in the xy-plane with center at the origin, and an angle θ in standard position. Find the value of each expression.

11.

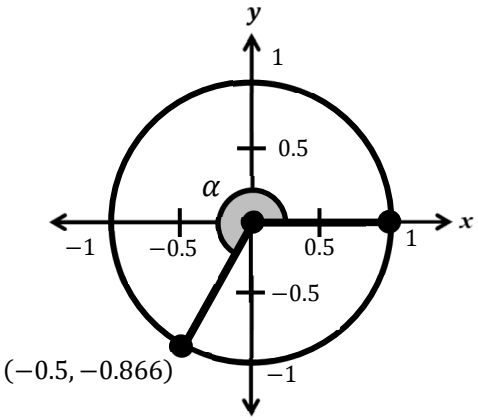


a. $\sin\theta =$

b. $\cos\theta =$

c. $\tan\theta =$

12.



a. $\sin\alpha =$

b. $\cos\alpha =$

c. $\tan\alpha =$

For each problem, an angle in standard position in the xy-plane is given in radians. A circle is centered at the origin with the given radius. What are the coordinates of the point of intersection of the terminal ray of the angle and the circle?

13. $\theta = \frac{\pi}{2}, r = 8$

14. $\theta = \frac{3\pi}{4}, r = 22$

In the xy-plane, the terminal ray of angle θ in standard position intersects a circle of radius r at the given point. What are the values of θ and r?

15. $(-3, -3\sqrt{3})$

16. $(-7, 0)$

The function f is given by $f(\theta) = \cos\theta$. Describe the concavity of f on the interval, and if f is increasing or decreasing on the interval.

17. $\frac{\pi}{2} < \theta < \pi$

18. $\pi < \theta < \frac{3\pi}{2}$

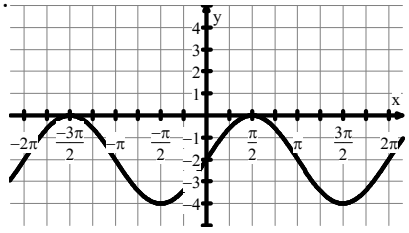
The function f is given by $f(\theta) = \sin\theta$. Describe the concavity of f on the interval, and if f is increasing or decreasing on the interval.

19. $0 < \theta < \frac{\pi}{2}$

20. $\frac{3\pi}{2} < \theta < 2\pi$

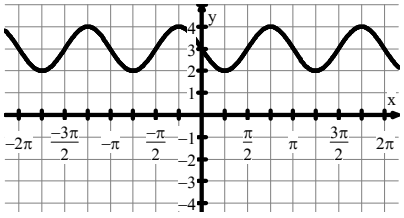
Write a <u>SINE</u> function for each graph. If needed use a phase shift, not a negative coefficient.

21.



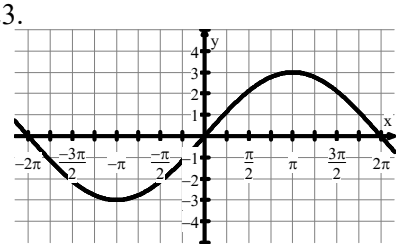
$y =$

22.



$y =$

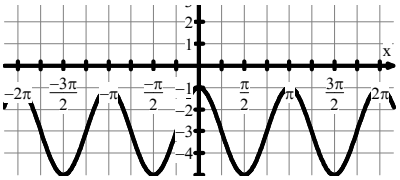
23.



$y =$

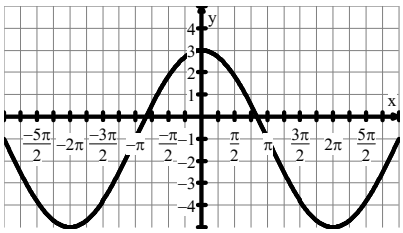
Write a <u>COSINE</u> function for each graph. If needed use a phase shift, not a negative coefficient.

24.



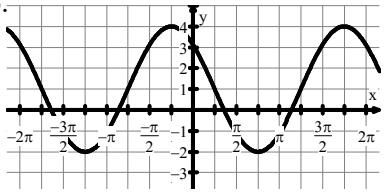
$y =$

25.



$y =$

26.



$y =$

27. Write the equation of a **<u>sine</u>** curve with the following transformations:

- Move down 5
- Move right $\frac{\pi}{7}$

$y =$

28. Write the equation of a **<u>cosine</u>** curve with the following transformations:

- One full period occurs 5 times between 0 and 2π.
- Vertical shift up 1.

$y =$

Identify the listed information for each trig function.

29. $y = 2\sin(\pi x - \pi) - 2$

Amp: _____ Period: _____

Midline: _____ Freq: _____

Max value: _____Min value: _____

Phase shift: _____

30. $y = 4 - 3\cos 5x$

Amp: _____ Period: _____

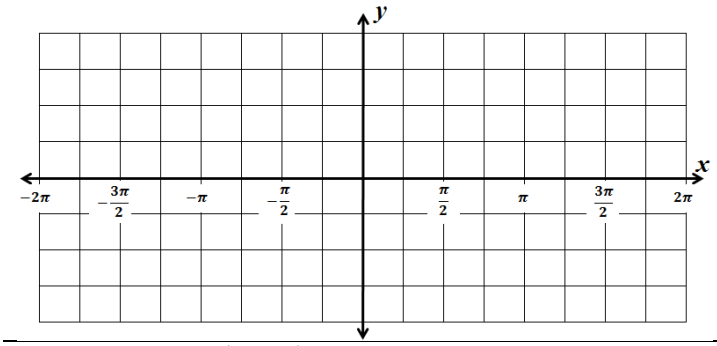
Midline: _____ Freq: _____

Max value: _____Min value: _____

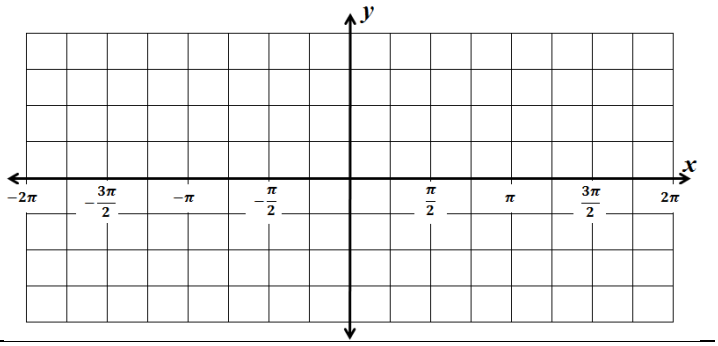
Phase shift: _____

Graph the function.

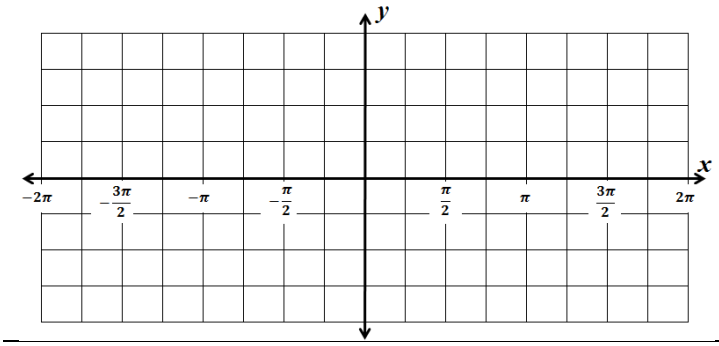
31. $y = 2\sin x + 2$



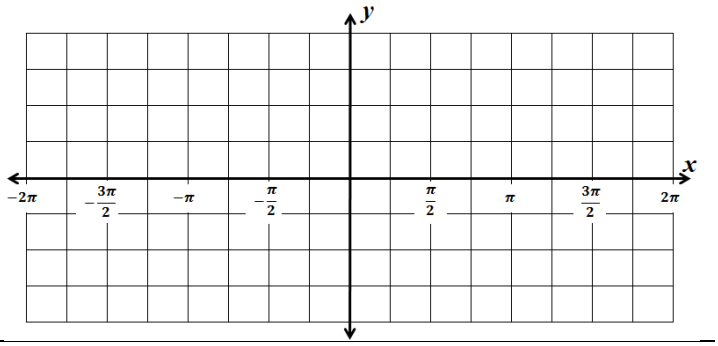
32. $y = -3\cos x$



33. $y = -2\sin\left(x - \frac{\pi}{4}\right)$



34. $y = 2\cos(2x + \pi) - 1$



35. After getting knocked off his boogie board, Mr. Kelly watches it float up and down on the ocean waves. The board moves 6.8 feet from its low point to its high point, returning to its low point every 7 seconds.

a. Write an equation that gives the board's vertical position y at time t if the board is at its lowest point when $t = 0$.

b. Explain why you chose $y = a\sin(bt)$ or $y = a\cos(bt)$ for part a.

36. Suppose you are riding a Ferris wheel. After everyone is loaded, the wheel starts to turn and the ride lasts for 150 seconds. Your height h (in feet) above the ground at any time t (in seconds) can be modeled by the equation

$$h(t) = 55\sin\left[\frac{\pi}{30}(t-10)\right] + 63.$$

a. What is the period?

b. What does the period represent in this scenario?

c. What is the frequency?

d. What does the frequency represent in this scenario?

e. What is your maximum height?

f. What is your minimum height?

g. How many circles will the Ferris Wheel make during the ride?

h. **Calculator active.** How high are you when the ride begins? (Use radians.)

i. **Calculator active.** What is your height when the ride stops?

37. The following data set can be modeled by a sinusoidal function. Use the data to answer each problem below.

x	0	1	2	3	4	5	6	7	8	9
$f(x)$	-49	250	-50	-349	-51	249	-52	-353	-51	252

x	10	11	12	13	14	15	16	17	18	19
$f(x)$	-48	-347	-51	249	-50	-351	-49	250	-53	-346

a. Estimate the period and frequency.

b. Estimate the vertical shift (midline).

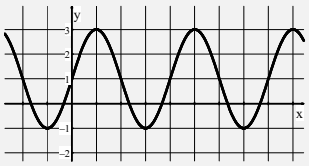
c. Estimate the amplitude.

d. Using the above information, create a sinusoidal function model.

e. Using a calculator, find a sinusoidal model from the given data set. Your answer should look similar to your estimate in part d.

Answers to Unit 3A Corrective Assignment

1a.



1b. Concave up.

2. Quadrant II

3. 4.54 radians

4. 5.103

5. 0

6. $\frac{\sqrt{3}}{2}$

7. $-\frac{\sqrt{3}}{2}$

8. $\frac{\sqrt{3}}{2}$

9. $-\frac{\sqrt{3}}{2}$

10. $-\frac{\sqrt{2}}{2}$

11a. 0.484
11b. 0.875
11c. 0.553

12a. -0.866
12b. -0.5
12c. 1.732

13. $(0, 8)$

14. $\left(-11\sqrt{2}, 11\sqrt{2}\right)$

15. $\theta = \frac{4\pi}{3}, r = 6$

16. $\theta = \pi, r = 7$

17. Concave up
Decreasing

18. Concave up
Increasing

19. Concave down
Increasing

20. Concave up
Increasing

21. $y = 2\sin(x) - 2$

22. $y = \sin(2x - \pi) + 3$

23. $y = 3\sin\left(\frac{1}{2}x\right)$

24. $y = 2\cos(2x) - 3$

25. $y = 4\cos\left(\frac{1}{2}x\right) - 1$

26. $y = 3\cos\left(x + \frac{\pi}{4}\right) + 1$

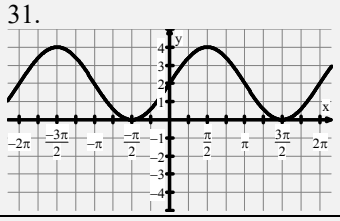
27. $y = \sin\left(x - \frac{\pi}{7}\right) - 5$

28. $y = \cos(5x) + 1$

29. Amp: 2 Period: 2
Mid: $y = -2$ Freq: $\frac{1}{2}$
Max: 0 Min: -4
P.S.: right 1

30. Amp: 3 Period: $\frac{2\pi}{5}$
Mid: $y = 4$ Freq: $\frac{5}{2\pi}$
Max: 7 Min: 1
P.S.: NONE

31.



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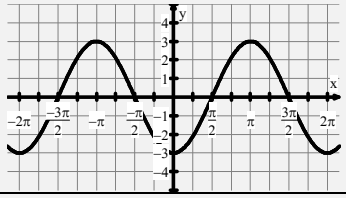

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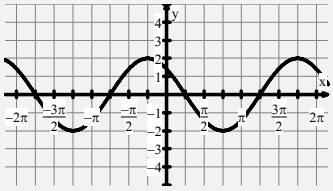

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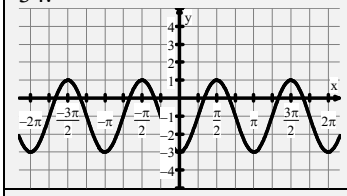

35a. $y = -3.4\cos\left(\frac{2\pi}{7}t\right)$

35b. Because the wave started at its lowest point.

36a. 60
36b. It takes 60 seconds for the Ferris Wheel to complete one circle.
36c. $\frac{1}{60}$
36d. Every second, the Ferris Wheel rotates $\frac{1}{60}$ of a circle.
36e. 118 ft.
36f. 8 ft.
36g. 2.5 circles
36h. 15.369 ft.
36i. 110.631 ft.

37a. Period: 4
Frequency: $\frac{1}{4}$
37b. $y = -50$
37c. 300
37d. $f(x) = 300\sin\left(\frac{\pi}{2}x\right) - 50$ or $f(x) = 300\cos\left(\frac{\pi}{2}[x - 1]\right) - 50$
37e. $f(x) = 299.6\sin(1.571x - 0.001) - 49.969$