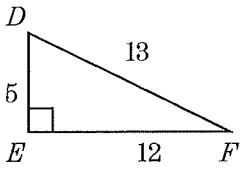
Sheet #673: Trig Functions

Name _____ _____

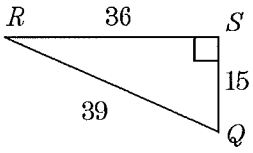
Graphing calculator needed.

1. Find $\tan \angle D$.



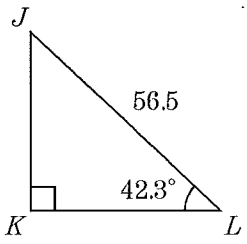
2. Find $\tan \angle F$.

3. Find $\sin \angle R$.



4. If $\sin \angle B = 0.9563$, find $m\angle B$ to the nearest degree.

5. Find JK to the nearest tenth.

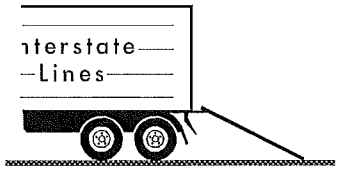


6. Find KL to the nearest tenth.

7. Find $m\angle J$ to the nearest tenth.

8. If $\sin \angle B = \frac{5}{13}$, find $\cos \angle B$.

9. One end of a ramp is raised to the back of a truck 5 feet above the ground. If the length of the ramp is 8 feet, what is the approximate measure of the angle the ramp makes with the ground? Round your answer to the nearest tenth of a degree.



Name the quadrant and reference angle of the given angle.

10. a) $125°$ b) $28\pi/15$

11. Find 3 functions (not 6). The terminal side of an angle α in standard position passes through the point $(-8, -6)$. Find the six trigonometric functions of α.

12. Complete the following chart. Assume $0 \leq \theta < 2\pi$.

radius r	central angle θ	arc length s
7	$\frac{3\pi}{8}$	
4		2π
	$\frac{7\pi}{10}$	$\frac{7\pi}{2}$
1	$\frac{2\pi}{3}$	
2		$\frac{7\pi}{4}$

13. Through how many radians will the hour hand of a clock rotate in

    a) 24 hours

    b) 6 hours

    c) 12 hours

    d) 8 hours

Find the amplitude and period of the function.

14. $y = \frac{2}{3}\sin(\theta) + 1$

Find the phase shift and vertical shift of the function.

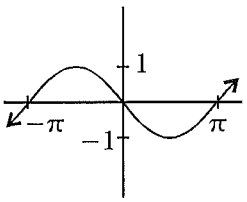
15. $y = 2 + \cos\left(\theta - \frac{\pi}{3}\right)$

Find the amplitude and period of the function.

16. $y = \cos\left(\frac{1}{2}x\right) + 8$

Write the equation of the graph.

17.



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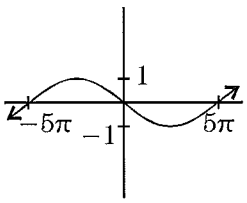

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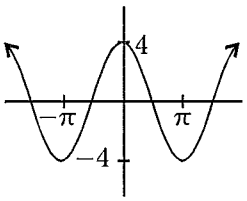

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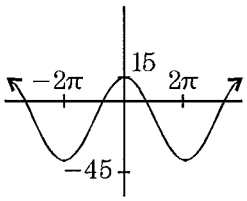

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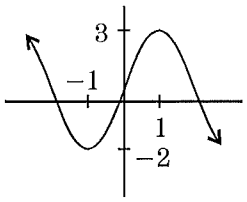


22. Consider the function $y = 5 - 2\cos 3(x + \frac{\pi}{6})$. Without actually graphing the function, write an explanation of how the constants 5, -2, 3, and $\frac{\pi}{6}$ affect the graph, using the graph of $y = \cos x$ as a basis for comparison.

23. Note: frequency $f = 1/T$ and angular frequency $B = 2\pi/T$. The voltage E in an electrical circuit is given by $E = 5\cos 120\pi t$, where t is time measured in seconds.

    a) Find the amplitude and the period of the function.

    b) What is the frequency (number of cycles completed in one second)?

    c) Find E when $t = 0, 0.03, 0.06, 0.09, 0.12$

    d) Graph E, for $0 \leq t \leq \frac{1}{30}$.

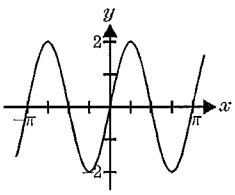
Solve.

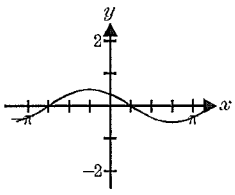
24. $2\cos\theta + 1 = 0$

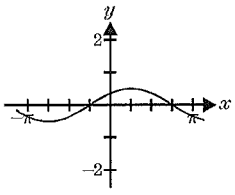
25. $\sin\theta - \frac{\sqrt{3}}{2} = 0$

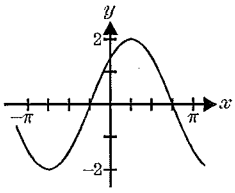
26. If $\cos\theta = -\frac{3}{4}$ and θ lies in quadrant III, find $\sin\theta$.

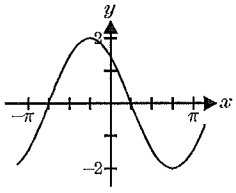
27. Which of the following is the graph of $y = 2\cos(x - \frac{\pi}{4})$?

a) 

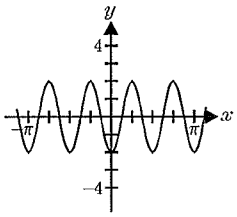
b) 

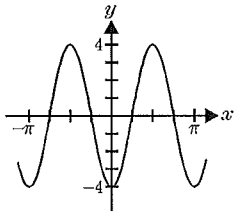
c) 

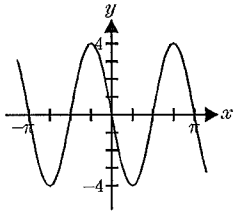
d) 

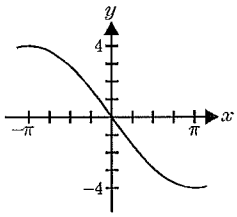
e) 

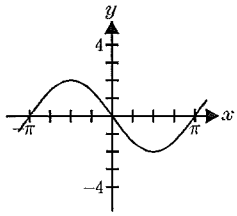
28. Which of the following is the graph of $f(x) = 4\cos(2x - \pi)$?

a) 

b) 

c) 

d) 

e) 

29. This graph illustrates a sine function for one complete cycle. Which of the following is the equation of this graph?

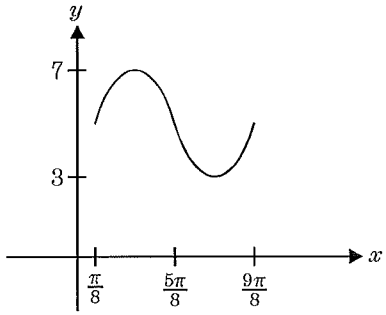
a) $y = 2\sin(2x - \frac{\pi}{4}) + 5$

b) $y = 2\sin(2x + \frac{\pi}{4}) + 5$

c) $y = 3\sin(x - \frac{\pi}{8}) + 5$

d) $y = 3\sin(x + \frac{\pi}{8}) + 5$

e) $y = 2\sin(x - \frac{\pi}{4}) + 5$



30. Solve for x algebraically. Work in radians. Give any one solution. Answer with 3 decimals. Show your work with the appropriate inverse trig function. You may check your work with the calulator.

a) $5 = 3\cos(x) + 4$

b) $9 = 5\sin(4\pi x) + 12$

31. Consider $y = 3\cos(2t) - 1$. Give answers to 4 decimals. Use your graphing calculator in radians.

    a) Find the value of y when $t = 2$.

    b) Find the first two values of t for which $y = 1$.

32. Consider the equation $y = 3\sin(\pi/2\ t) + 4$. Answer to 4 decimals. Use your graphing calculator in radians.

    a) Find the period.

    b) Sketch the graph. Label the axes with units and variables.

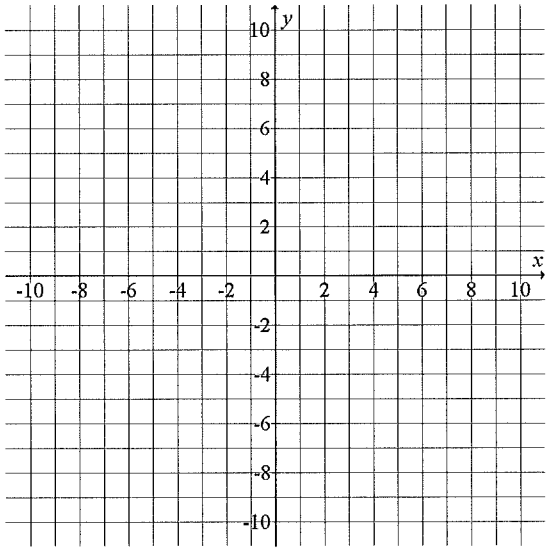
    c) Compared to its parent graph, $y = \sin(t)$, how has the graph of the equation above been shifted and/or stretched?

    d) Sketch the line $y = 5$.

    e) Find the values of t for the first two positive intersections of the line and the curve.

    f) How are the two t values related? Give a formula. Explain.

    g) What are formulas for the third, fourth, and fifth intersections? (Don't find them, just give the formulas.)



33. Consider a population of deer that varies over the course of a year, from a low in December (time $t = 0$ months) to a high in June ($t = 6$) and back down to a low in December ($t = 12$). One can model the population (y) as a function of time using a sinusoidal function (sine or cosine). In a certain year, there are 2000 animals in December and the population is expected to triple (to 6000) by June.

    a) What is the period?

    b) Write a formula for the number of animals.

    c) Predict the number of animals in March.

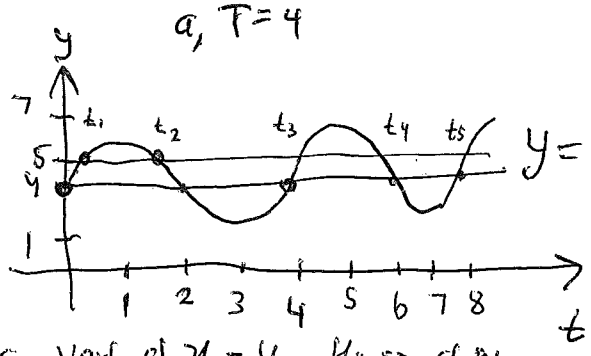
    d) Predict at what times the population will consist of 5000 animals during the course of the year.

Sheet #673: Trig Functions

Answer List

1. $\frac{12}{5}$
2. $\frac{5}{12}$
3. $\frac{5}{13}$
4. $73°$
5. 38.0
6. 41.8
7. $47.7°$
8. $\frac{12}{13}$
9. $38.7°$
10. a/ II, $55°$ b/ III $2\pi/15$.
11. $\sin\theta = -\frac{3}{5}$, $\cos\theta = -\frac{4}{5}$, $\tan\theta = \frac{3}{4}$, $\csc\theta = -\frac{5}{3}$, $\sec\theta = -\frac{5}{4}$, $\cot\theta = \frac{4}{3}$
12. →
13. 4π; π; 2π; $\frac{4\pi}{3}$
14. $A = 2/3$. $T = 2\pi$ or $360°$
15. $K = 2$ $Bh = \pi/3$
16. $A = 1$ $T = 2\pi/\frac{1}{2} = 4\pi$
17. $y = -\sin x$
18. $y = -\sin\frac{x}{5}$
19. $y = 4\cos x$
20. $y = 30\cos\left(\frac{x}{2}\right) - 15$
21. $y = \frac{3}{2}\sin\left(\frac{\pi x}{2}\right) + \frac{1}{2}$
22. 5: vert shift up 5 units; -2: makes graph steeper by a factor of 2 and also reflects graph across x-axis; 3: converts period from 2π to $\frac{2\pi}{3}$; $\frac{\pi}{6}$: shift left $\frac{\pi}{6}$ units.
23. 5, $\frac{1}{60}$; 60; 5, 1.545, -4.045, -4.045, 1.545
24. $\frac{2\pi}{3}, \frac{4\pi}{3}$
25. $\frac{\pi}{3}, \frac{2\pi}{3}$
26. $-\frac{\sqrt{7}}{4}$
27. d
28. b
29. a
30. a/ $\cos^{-1}(1/3) \approx 1.231$. b/ $\frac{\sin^{-1}(-3/5)}{4\pi} \approx -0.0512$
31. a/ $y = -2.9609$. b/ $t_1 = 0.4205$, $t_2 = 2.7211$
32. →
33. a/ 12 months b/ $y = -2000\cos\left(\left(\frac{2\pi}{12}\right)t\right) + 4000 = -2000\cos\left(\frac{\pi}{6}t\right) + 4000$
c/ $y = 4000$. d/ $t_1 = 4$, $t_2 = 8$. April & August.

32.



a/ $T = 4$

c/ Vert. shift $= 4$. Horiz. shift $= 0$
Vert. stretch $= 3$. $B = \pi/2$ means a horiz. compression by $\pi/2$

e/ $t_1 = 0.2163$
$t_2 = 1.7837$

f/ $t_1 + t_2 = 2$ (half the period)

g/ $t_3 = t_1 + 4$
$t_4 = t_2 + 4$
$t_5 = t_1 + 8$
Where 4 is the period

12. $2\pi/8$
$2\pi/4 = \pi/2$
$\frac{\pi/2}{7\pi/10} = \frac{1/2}{1/10} = \frac{10}{2} = 5$
$\frac{2\pi}{3}$
$\frac{7\pi}{4}/2 = \frac{7\pi}{8}$

→ Vertical stretch, $A = 2$. → Minus sign

(phase shift $= Bh = 3\left(\frac{\pi}{6}\right) = \frac{\pi}{2}$ left.)