1. Make sure you can solve all the problems on the homework assignments.
2. Simplify each expression without a calculator using properties of logarithms
   (a) $\log_3\left(\frac{1}{27}\right)$

   (b) $\log_{10}(10,000)$

   (c) $\ln\left(e^{-2}\right)$
3. Solve the following exponential equations
   (a) $e^{3x} = 12$

   (b) $4^{2x-3} = 44$

   (c) $1000(1.03)^t = 5000$

   (d) $10 - \left(\frac{1}{2}\right)^x = 5$.
4. The population of Seattle was 563, 374 in 2000 and 608,660 in 2010. Assuming the poulation grows exponentially and continues to grow at the same rate, write a function $f(t)$ such that

   $$f(t) = \text{the population of Seattle } t \text{ years after 2000.}$$

   When will the population exceed 1 million?
5. A scientist has 100 mg of a radioactive substance which decays exponentially. After 4 hours, there is 80 mg of the substance remaining. Write a function which models the decay of this substance. What is the half-life of the substance? How long will it take the substance to decay to 20 mg?
6. Solve each equation
   (a) $4^{4x-7} = 3^{9x-6}$

   (b) $3e^{0.09t} = e^{0.14t}$

   (c) $2\ln(3x) + 3 = 1$

   (d) $\log_{10}(x+4) - \log_{10}(x+3) = 1$

(e) $\log_6(x^2) - \log_6(x+1) = 1$

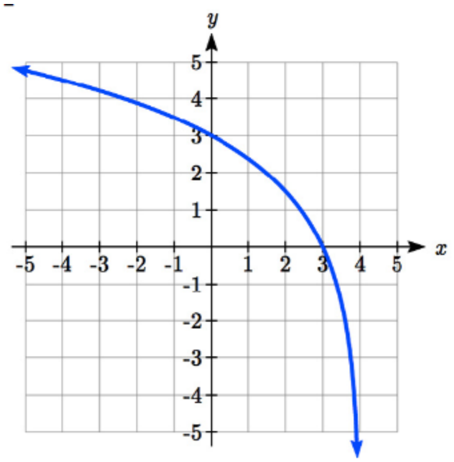
7. Sketch a graph of each function

(a) $\log_2(x+2)$

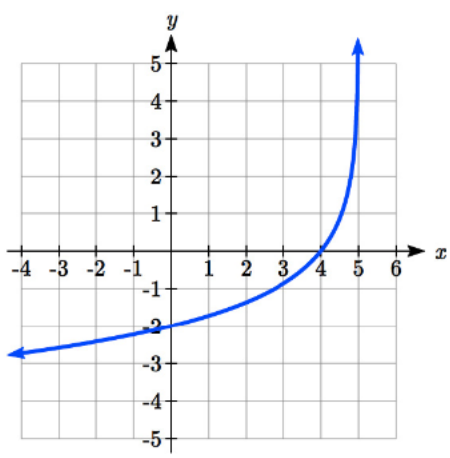
(b) $-2\ln(-x)+1$

8. Find an equation for each transformed logarithmic function below:

(a)

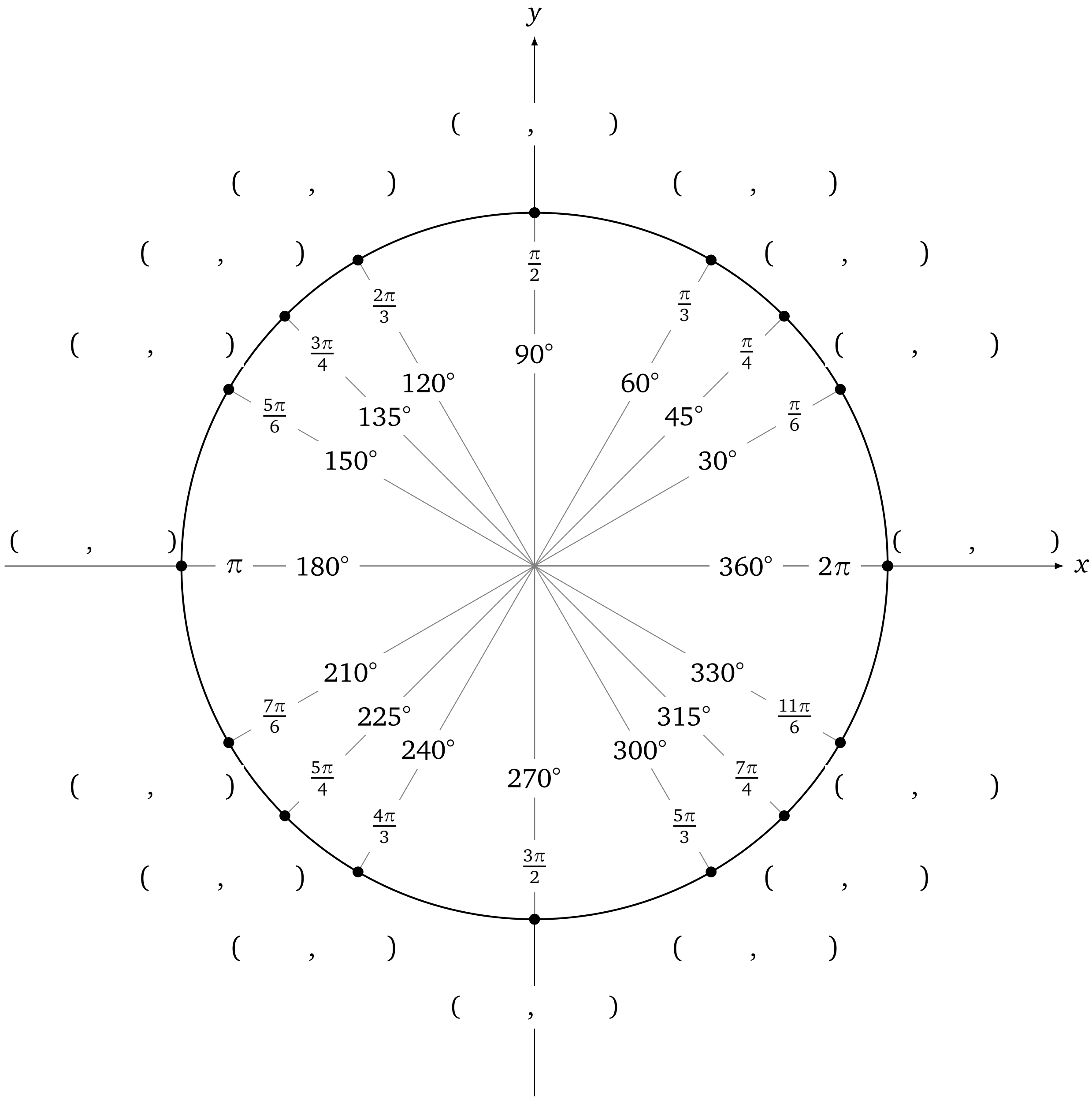


(b)



9. Write and equation for a circle that has center $(7, -2)$ and passes through $(-10, 0)$.
10. Sketch a graph of $(x+8)^2 + (y-3)^2 = 16$.
11. Find the x-intercepts of a circle with center $(2, 3)$ and radius 4.
12. Find the points where the circle with center $(1, 2)$ and radius 5 intersects the line $f(x) = -2x + 3$. Compute the distance between the two points of intersection.
13. Convert $163°, 467°, -54°$ to radians.
14. Convert $\frac{26\pi}{9}, -6$, and $\frac{\pi}{7}$ radians to degrees.
15. On a circle of radius 7 miles, compute the length of the arc that subtends a central angle of 5 radians.
16. Compute the area of a sector of a circle of radius 10 meters subtended by an angle of $\frac{\pi}{5}$ radians.

17. Fill in the points at each of the following angles on the unit circle ("unit circle" means it has radius 1). Remember that $x = r\cos(\theta) = \cos(\theta)$ (since $r = 1$ here) and $y = r\sin(\theta) = \sin(\theta)$ (since $r = 1$ here), so you'll need to calculate the values of $\sin(\theta)$ and $\cos(\theta)$ for these angles.



18. P is a point on the unit circle (the circle of radius 1 centered at (0,0)) with y-coordinate $\frac{3}{5}$. If P is in the second quadrant, what is the x-coordinate of P?

19. Suppose that $\cos(\theta) = \frac{1}{7}$ and θ is in the 4th quadrant. What are $\sin(\theta), \tan(\theta), \sec(\theta), \csc(\theta)$,

and $\cot(\theta)$?

20. Suppose that $\sin(\theta) = \frac{3}{8}$ and θ is in the 3rd quadrant. What are $\cos(\theta), \tan(\theta), \sec(\theta), \csc(\theta)$, and $\cot(\theta)$?

21. Suppose that $\sin(\theta) = \frac{3}{11}$. What is $\csc(\theta)$?

22. Compute $\sin\left(\frac{43\pi}{6}\right)$ without a calculator.

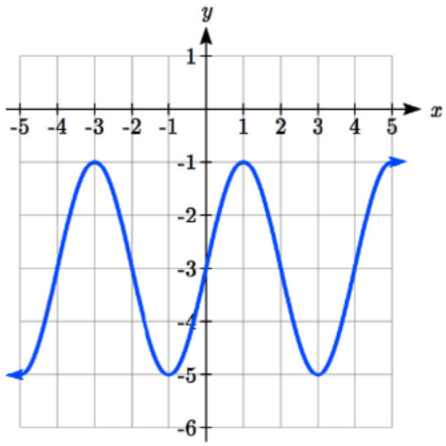
23. Find an angle θ in $[0, 2\pi)$ which is not equal to $(0.7)\pi$ with $\cos(\theta) = \cos((0.7)\pi)$.

24. Find an angle θ in $[0, 2\pi)$ which is not equal to $(1.1)\pi$ with $\csc(\theta) = \csc((1.1)\pi)$.

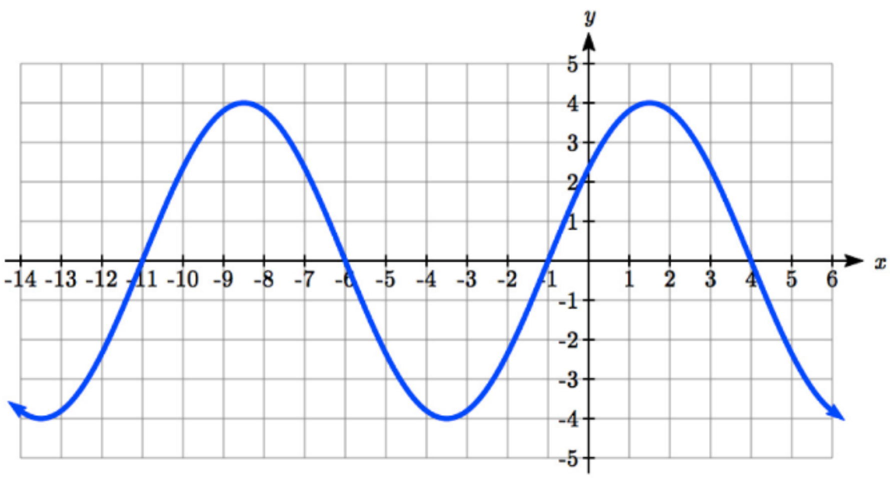
25. Simplify each expression
    (a) $\frac{\sec(t)-\cos(t)}{\sin(t)}$
    (b) $\frac{\cot(t)}{\csc(t)}$
    (c) $\frac{1+\sin(t)}{1+\csc(t)}$
    (d) $\frac{1-\sin^2(t)}{\sin^2(t)}$

26. Prove each identity
    (a) $\frac{\sin^2(\theta)}{1+\cos^2(\theta)} = 1 - \cos(\theta)$
    (b) $\tan^2(t) = \frac{1}{cos^2(t)-1}$
    (c) $\sec(x) - \cos(x) = \sin(x)\tan(x)$
    (d) $1 + \cot(\alpha) = \cos(\alpha)(\sec(\alpha) + \csc(\alpha))$

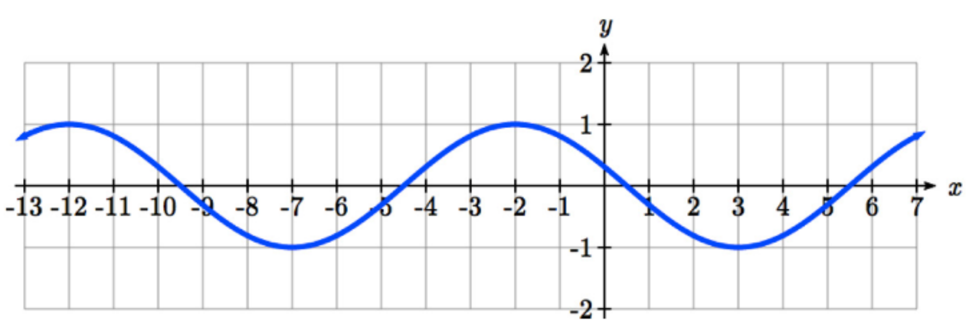
27. Find an equation for each sinusoidal graph below
    (a)


y
x
1
-1
-2
-3
-4
-5
-6
-5 -4 -3 -2 -1 1 2 3 4 5

(b)


y
x
5
4
3
2
1
-1
-2
-3
-4
-5
-14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6

(c)


y
x
2
1
-1
-2
-13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7

28. Evaluate without a calculator
    (a) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

    (b) $\tan^{-1}(-\sqrt{3})$

    (c) $\cos^{-1}\left(-\frac{1}{2}\right)$

29. Evaluate without a calculator
    (a) $\cos\big(\tan^{-1}(4)\big)$

    (b) $\sin^{-1}\left(\cos\left(\frac{4\pi}{3}\right)\right)$

    (c) $\tan\left(\sin^{-1}\left(\frac{1}{3}\right)\right)$.

30. Find a simplified expression for $\sin\left(\cos^{-1}\left(\frac{x}{5}\right)\right)$.

31. Find all solutions to $4\sin\left(\frac{\pi}{12}t\right)+7=9$.

32. Find all solutions to $3\sin(2\theta)+1=\frac{1}{3}$.

33. Find all solutions to $\cos(2t)=-\frac{3}{4}$ which are in the interval $[0,2\pi)$.

34. Find all solutions to the following equation
    (a) $-3\sin(t)=15\cos(t)\sin(t)$

    (b) $4\cos^2(x)-4=15\cos(x)$

    (c) $8\cos^2(\theta)+6\sin(\theta)+1=0$

    (d) $\tan(x)-3\sin(x)=0$

35. Simplify the following
    (a) $4\sin(8x)\cos(8x)$

    (b) $\cos^2(6x)-\sin^2(6x)$

36. Find all solutions
    (a) $-6\sin(-2t)+9\sin(t)=0$

(b) $\cos(-6x) - \cos(3x) = 0$

37. Prove the identities

(a) $(\sin(t) - \cos(t))^2 = 1 - \sin(2t)$

(b) $\frac{\sin(2\theta)}{1+\cos(2\theta)} = \tan(\theta)$