Chapters 9, 10, and 11 practice questions

November 29, 2016

1. Define the following terms:
   (a) Half-life
   (b) Doubling time
   (c) growth/decay rate
   (d) $\log_b(y)$
   (e) Polynomial function
   (f) Rational function
   (g) Radians
   (h) The unit circle
   (i) The amplitude of a function
   (j) The period of a function
2. Find the sine, cosine, tangent, secant, cosecant, and cotangent of the following angles:
   (a) $\theta = 330°$.
   (b) $\theta = 390°$.
   (c) $\theta = 480°$.
   (d) $\theta = \frac{9\pi}{2}$
   (e) $\theta = -3\pi$.
   (f) $\theta = \frac{-16\pi}{3}$.
3. What is the length of the arc on the circle of radius 7 that corresponds to an angle of $\frac{3\pi}{7}$.
4. What is the area of the sector (slice) of a circle of radius 7 that corresponds to an angle of $\frac{3\pi}{7}$.

5. What is the range of: $f(x) = \cos(x)$, $g(x) = \sin(x)$, and $h(x) = \tan(x)$

6. Find all values of t so that the point $(t, \frac{4}{5})$ is on the unit circle.

7. Find the four smallest positive values of θ that satisfy $\cos(\theta) = -1/2$.

8. If $\tan(\theta) = 3$, and $\pi \leq \theta \leq \frac{3\pi}{2}$, then what are $\cos(\theta)$ and $\sin(\theta)$?

9. If $\sin(\theta) = -1/9$ and $-\pi \leq \theta \leq -\frac{\pi}{2}$, then what is $\cos(\theta)$?

10. Suppose a 15 foot ladder is leaning against a wall, making an angle of 71° with the floor (as measured from a perpendicular line from the base of the ladder to the wall). How far away is the base of the ladder from the wall? (Leave your answer in terms of trigonometric functions)

11. (Harder version of the previous problem) Suppose a ladder is leaning against a wall, making an angle of 45° with the floor (as measured from a perpendicular line from the base of the ladder to the wall). Suppose that after the base of the ladder is moved 3 feet closer to the wall, the ladder now makes an angle of 51° with the floor. How tall is the ladder?

12. Prove that
$$\sin^2(\theta) = \frac{\tan^2(\theta)}{1 + \tan^2(\theta)}$$
for all θ except odd multiples of $\frac{\pi}{2}$.

13. Prove that
$$\frac{1}{\sin^2(\theta)} + \frac{1}{\cos^2(\theta)} = \frac{1}{\sin^2(\theta)\cos^2(\theta)}$$
for all θ except multiples of $\frac{\pi}{2}$.

14. Prove that
$$\sec^2(\theta) + \csc^2(\theta) = \sec^2(\theta)\csc^2(\theta)$$
for all θ except multiples of $\frac{\pi}{2}$.

15. What are the domains and ranges of $f(x) = \cos^{-1}(x)$, $g(x) = \sin^{-1}(x)$, and $h(x) = \tan^{-1}(x)$.

16. Evaluate: $\tan(\tan^{-1}(-1/2))$, $\cos(\cos^{-1}(1/2))$, and $\sin(\cos^{-1}(1/2))$.

17. Evaluate: $\tan^{-1}(\tan(\frac{17\pi}{6}))$, $\cos^{-1}(\cos(\frac{17\pi}{6}))$.

18. Find a formula for $\tan(\sin^{-1}(t))$. (See example 10 in §10.2).

19. Find a formula for $\sec(\tan^{-1}(t))$. (This comes up in math 10/20A)

20. Graph $f(x) = -10\sin(\pi(x - \frac{1}{2})) - 1$. What are the period and amplitude of this function? What is the range of this function?

21. Graph $g(x) = -10\cos(\pi(x - \frac{1}{2})) - 1$. What are the period and amplitude of this function? What is the range of this function?