MAT170 Review Problems for Exam 3

A. Applications of Exponential Equations – Section 3.5

1. How long will it take any quantity of iodine 131 to decay to 25% of its initial amount, knowing that it decays according to the function $A(t) = A_0 e^{-.087t}$ where t is the number of days?

2. The population of Merchantville was 20,000 in 1990 and 25,000 in 1995. If exponential growth is assumed, find a model for the population growth and then use the model to determine the population in 2008.

3. A sample of 500 grams of radioactive lead 210 decays to polonium 210 according to the function $A(t) = 500e^{-.032t}$ where t is in years. Find the amount of the sample remaining after
   (i) 4 years (ii) 8 years (iii) Find the half-life

B. Angles and Radian Measures (*Section 4.1*)

4. (a) Convert the angle –225° to radians. Express answer as a multiple of π.
   (b) Convert the angle $\frac{3\pi}{2}$ radians to degrees.
5. (a) Find a positive angle less than 360° that is coterminal with the angle –760°.
   (b) Find a positive angle less than 2π radians that is coterminal with the angle $\frac{17\pi}{2}$.
6. Find the length of arc on a circle with radius $r = 16$ inches intercepted by a central angle $\theta = 60^\circ$. Round the answer to 2 decimal places.

7. If the length of the arc on a circle of radius 10 cm is 20 cm, find the measure of the central angle in degrees.

8. Draw 620° in standard position. Find a coterminal angle for 620° between 0° and 360°. Find a coterminal angle less than zero for 620°. Find the reference angle for 620°.

C. Trigonometric Functions (*Section 4.2*)

9. (a) Given that $\sin(t) = \frac{6}{7}$ and t is in quadrant II.
   Find the exact value cos(t), tan(t), sec(t), csc(t), and cot(t).
   (b) Given that $\cos(t) = \frac{-3}{5}$ and t is in quadrant III.
   Find the exact value sin(t), tan(t), sec(t), csc(t), and cot(t).

D. Applications (*Section 4.3*)

10. A telephone pole is 55 feet tall. How long should a guy wire be if it to be attached 15 feet from the top and is to make an angle of 35° with the ground? Give your answer to the nearest tenth of a foot.

11. A plane is flying at an altitude of 9000m. The pilot finds that the angle of depression to the airport is 20°. Find the distance between a point on the ground directly below the plane and the airport.

E. Reference Angle (*Section 4.3*)

12. Find the reference angle for each of the following angles;

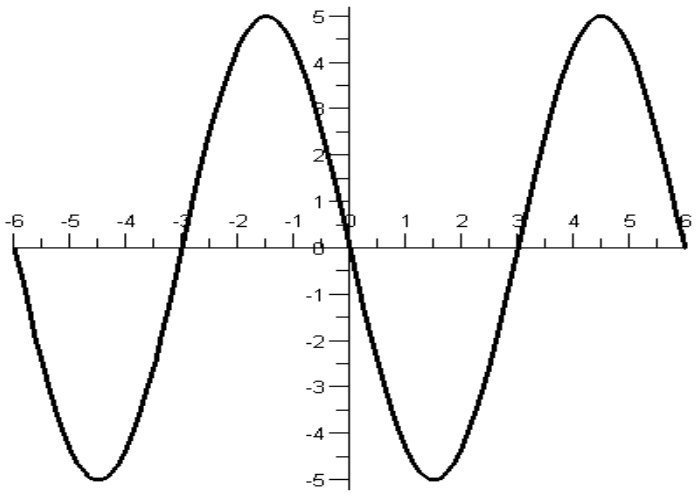
a) 210° b) –250° c) $\frac{23\pi}{4}$ d) $-\frac{13\pi}{3}$

F. Graphs of Trigonometric Functions (*Section 4.5 - 4.6*)

13. (a) Given the function $y = -2\sin\left(2x + \frac{\pi}{2}\right)$ find the amplitude, period, and phase shift.

(b) Given the function $y = 4\cos(3x + \pi)$ find the amplitude, period, and phase shift.

14. Find the equation for the graph shown below.



15. (a) Suppose $\sin(-t) = \frac{-1}{2}$ and $\cos(-t) = \frac{\sqrt{3}}{2}$, find tan(t)

(b) Suppose $\sin(-t) = -0.32$ find csc(t).

16. (a) Graph the function $f(x) = 2\sec(x)$ to determine the range of $f(x)$.

(b) Graph the function $g(x) = 3\csc(x)$ to determine the range of $g(x)$.

G. Inverse Trigonometric Functions (*Section 4.7*)

Find the exact value of each of the following:

17. $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)$ 18. $\cos\left[\tan^{-1}\left(\frac{2}{3}\right)\right]$ 19. $\tan\left(\cos^{-1} x\right)$

20. $\sin^{-1}\left[\sin\left(\frac{2\pi}{3}\right)\right]$ 21. $\cos^{-1}[\cos(135°)]$ 22. $\sin^{-1}\left[\sin\left(\frac{7\pi}{6}\right)\right]$

23. $\cos\left(\sin^{-1}\left(\frac{x}{3}\right)\right)$ 24. $\tan(\sin^{-1}(3x))$

H. Verifying Trigonometric Identities (*Section 5.1*)

Verify each trigonometric identity:

25. $(\cos(\theta)-\sin(\theta))^2+(\cos(\theta)+\sin(\theta))^2=2$

26. $\frac{\tan(\theta)\cdot\cot(\theta)}{\csc(\theta)}=\sin(\theta)$ 27. $\tan(\theta)+\frac{\cos(\theta)}{1+\sin(\theta)}=\sec(\theta)$

28. $\cot(x)+\tan(x)=\sec(x)\csc(x)$ 29. $(\sec(x)-\tan(x))^2=\frac{1-\sin(x)}{1+\sin(x)}$

30. $\frac{1-\cot(x)}{\cos(x)}=\sec(x)-\csc(x)$

I. Sum and Difference Formulas (*Section 5.2*)

31. Find the exact value of the expression: $\cos\frac{5\pi}{12}\cos\frac{\pi}{12}+\sin\frac{5\pi}{12}\sin\frac{\pi}{12}$

32. Find the exact value of the expression: $\cos(135°+30°)$

33. Find the exact value of the expression: $\frac{\tan\frac{\pi}{5}-\tan\frac{\pi}{30}}{1+\tan\frac{\pi}{5}\tan\frac{\pi}{30}}$

34. Verify the identity: $\cos(x-\frac{\pi}{2})=\sin x$

35. **(*Section 4.2*)** Label the unit circle, i.e. label all the special angles, and the x and y coordinates for the angles.