MAT 170 **EXAM 3 REVIEW**

Trigonometric Functions (*Section 4.2*)

1. (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).

Angles and Radian Measures (*Section 4.1*)

2. (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.

3. (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 $\frac{17\pi}{2}$.

4. 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.

5. 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.

6. 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°.

Applications (*Section 4.3*)

7. 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.

8. 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.

Reference Angle (*Section 4.3*)

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

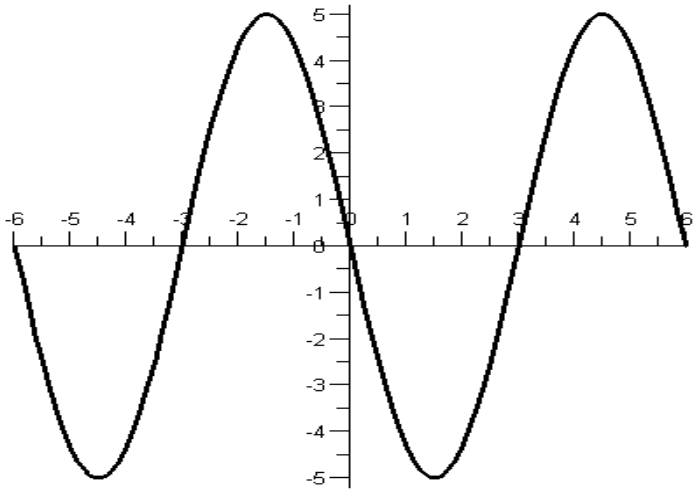
a) 210° b) –250° c) $\frac{23\pi}{4}$ d) $-\frac{13\pi}{3}$

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

10. (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.

11. Find the equation for the graph shown below.



12. (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).

13. (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 $g(x)$.

Inverse Trigonometric Functions (*Section 4.7*)

Find the exact value of each of the following:

14. $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)$

15. $\cos\left[\tan^{-1}\left(\frac{2}{3}\right)\right]$

16. $\tan\left(\cos^{-1} x\right)$

17. $\sin^{-1}\left[\sin\left(\frac{2\pi}{3}\right)\right]$

18. $\cos^{-1}\left[\cos(35°)\right]$

19. $\sin^{-1}\left[\sin\left(\frac{7\pi}{6}\right)\right]$

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

21. $\tan\left(\sin^{-1}(3x)\right)$

Verifying Trigonometric Identities (*Section 5.1*)

Verify each trigonometric identity:

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

23. $\frac{\tan(\theta)\cdot\cot(\theta)}{\csc(\theta)} = \sin(\theta)$

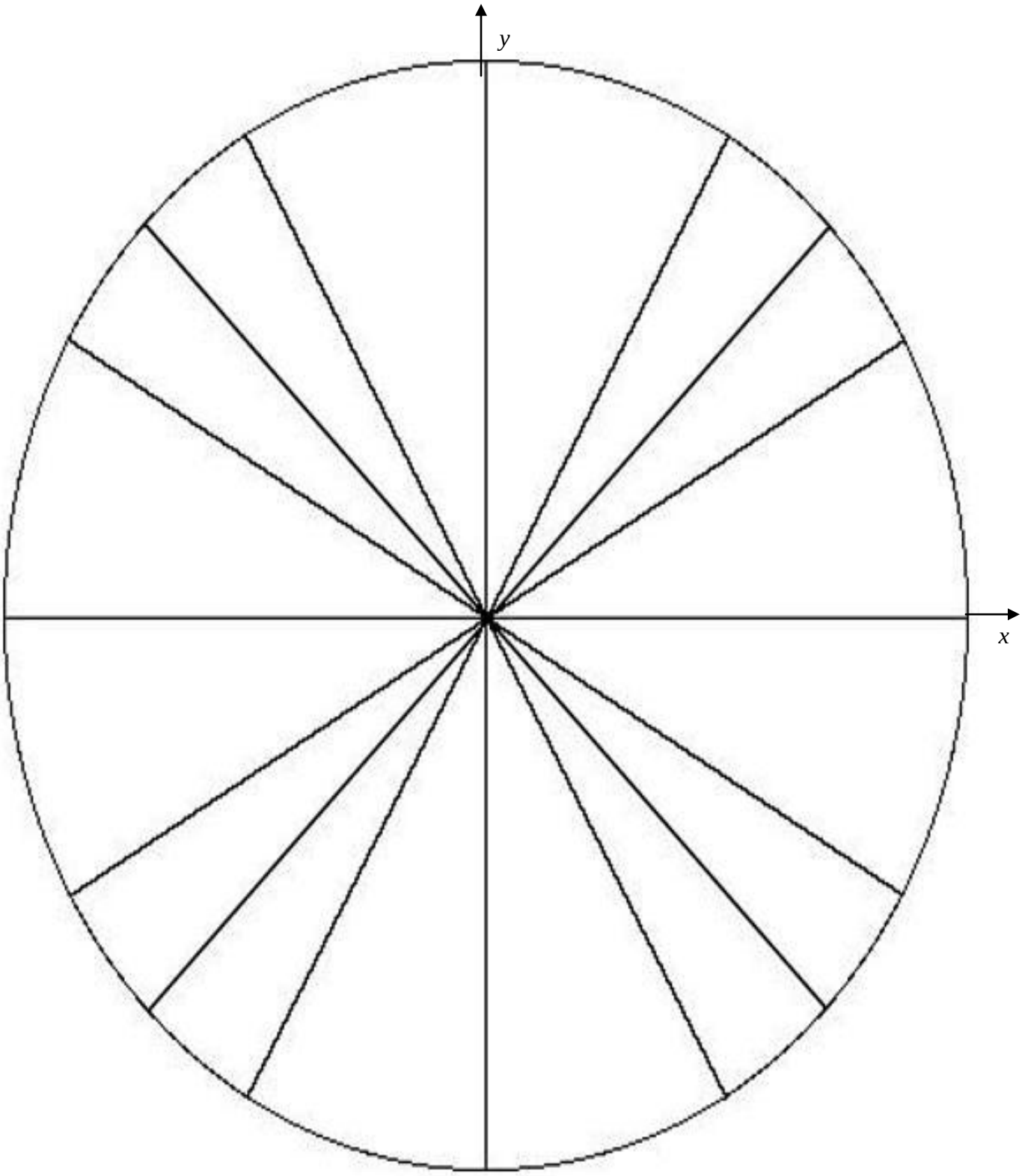
24. $\tan(\theta) + \frac{\cos(\theta)}{1+\sin(\theta)} = \sec(\theta)$

25. $\cot(x) + \tan(x) = \sec(x)\csc(x)$

26. $(\sec(x) - \tan(x))^2 = \frac{1-\sin(x)}{1+\sin(x)}$

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

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



Applications of exponential equations (*Section 3.5*):

29. 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?

30. 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.

31. 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.

Sum and Difference Formulas (*Section 5.2*)

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

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

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

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

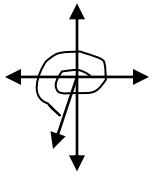
<u>Answers</u>

1. a) $\cos(t) = -\frac{\sqrt{13}}{7}$ $\tan(t) = -\frac{6}{\sqrt{13}} = -\frac{6\sqrt{13}}{13}$ $\sec(t) = -\frac{7}{\sqrt{13}} = -\frac{7\sqrt{13}}{13}$

$\csc(t) = \frac{7}{6}$ $\cot(t) = -\frac{\sqrt{13}}{6}$

b) $\sin(t) = -\frac{4}{5}$ $\tan(t) = \frac{4}{3}$ $\cot(t) = \frac{3}{4}$ $\csc(t) = -\frac{5}{4}$ $\sec(t) = -\frac{5}{3}$

2. a) $-\frac{5\pi}{4}$ b) 270° 3. a) 320° b) $\frac{\pi}{2}$ 4. 16.76 cm 5. 114.59°

6.  coterminal angles: 260°, –100° reference angle: 80°

620°

7. 69.7 feet 8. 24727.3 m 9. a) 30° b) 70° c) $\frac{\pi}{4}$ d) $\frac{\pi}{3}$

10. a) amplitude = 2, period = π, phase shift = $\frac{\pi}{4}$ to the left

b) amplitude = 4, period = $\frac{2\pi}{3}$, phase shift = $\frac{\pi}{3}$ to the left

11. $-5\sin\left(\frac{\pi}{3}x\right)$ or $5\sin\left(\frac{\pi}{3}(x-3)\right)$ or $5\sin\left(\frac{\pi}{3}(x+3)\right)$ or $5\cos\left(\frac{\pi}{3}(x-4.5)\right)$

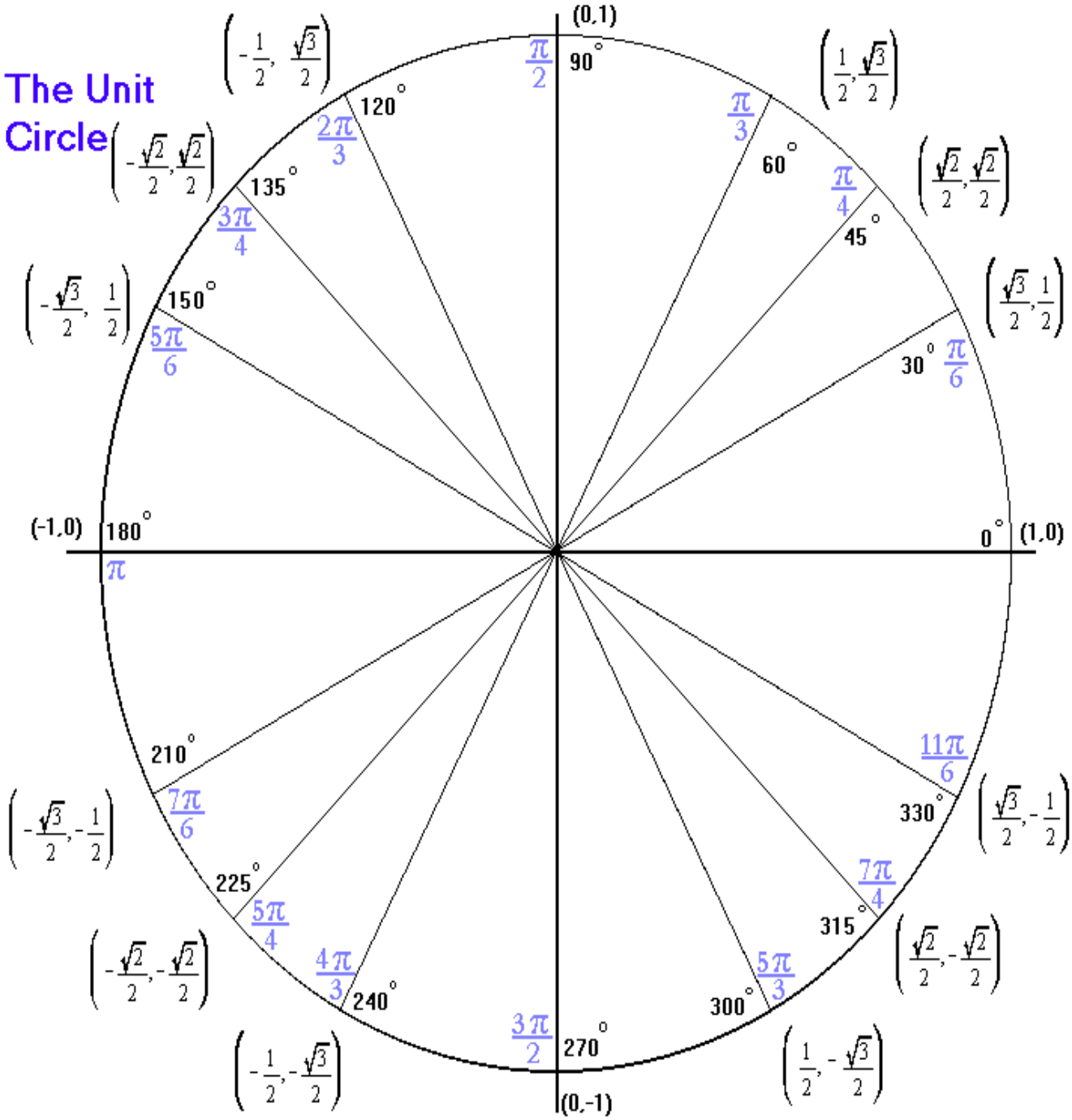
12. a) $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ b) 3.125 13. a) $(-\infty,-2]\cup[2,\infty)$ b) $(-\infty,-3]\cup[3,\infty)$

14. $-60°$ or $-\frac{\pi}{3}$ 15. $\frac{3\sqrt{13}}{13}$ 16. $\frac{\sqrt{1-x^2}}{x}$ 17. $\frac{\pi}{3}$ or 60° 18. 135° or $\frac{3\pi}{4}$

19. –30° or $-\frac{\pi}{6}$ 20. $\frac{\sqrt{9-x^2}}{3}$ 21. $\frac{3x}{\sqrt{1-9x^2}}$

Verifying Trigonometric Identities
Methods may vary.

28. THE UNIT CIRCLE



29. 15.93 days 30. $P = 20{,}000e^{.044629\,t}$; 44,658

31. i) 439.93 gm ii) 387.07 gm iii) $\frac{\ln(2)}{k} = \frac{\ln(2)}{0.032} = 21.66\,\text{years}$

32. ½ 33. $-\frac{1}{4}\sqrt{2}(\sqrt{3}+1)$ 34. $\frac{\sqrt{3}}{3}$ 35. Methods may vary.