Precalculus 1st Semester Examination Chapters 4, 5 Name _____

Place all answers in the spaces provided.

I. Matching

_____ 1. $\tan(90^\circ)$

_____ 2. $\sin(180^\circ)$

_____ 3. $\cos\left(\frac{3\pi}{2}\right)$

_____ 4. $\cos(-5\pi)$

_____ 5. $\sec\left(\frac{5\pi}{6}\right)$

_____ 6. $\cos\left(\frac{5\pi}{6}\right)$

_____ 7. $\sec\left(\frac{\pi}{3}\right)$

_____ 8. $\csc(150^\circ)$

_____ 9. $\tan\left(\frac{5\pi}{4}\right)$

_____ 10. $\cot(330^\circ)$

A. $-\frac{\sqrt{3}}{2}$

B. ½

C. 2

D $-\frac{\sqrt{3}}{3}$

E. $\frac{2\sqrt{3}}{3}$

F. 0

G. 1

H undefined

I. –1

J. $\sqrt{2}$

K. $\sqrt{3}$

L. None of these

II. Multiple Choice

_____ 11. If $\cos\theta = -\frac{3}{5}$ and $\tan\theta = -\frac{4}{3}$, then $\sin\theta$ =

(A) $\frac{3}{4}$ (B) $\frac{4}{5}$ (C) $-\frac{3}{4}$ (D) $-\frac{4}{5}$

_____ 12. The amplitude of $y = 2 + 3 \sin 5(x - \pi)$ is:

(A) 2 (B) π (C) 3 (D) $\frac{2\pi}{5}$

_____ 13. If $\cos x = \frac{7}{25}$ and $\frac{3\pi}{2} < x < 2\pi$, then sin(x) =

(A) $\frac{3\sqrt{2}}{5}$ (B) $-\frac{3\sqrt{2}}{5}$ (C) $\frac{24}{25}$ (D) $-\frac{24}{25}$

_____ 14. The period of the function $y = \sin(x)$ is:

(A) 2 (B) π (C) 6 (D) 2π

_____ 15. A function having the period 180° is:

(A) $y = \sin(2x)$ (B) $y = ½ \sin(x)$ (C) $y = \sin(½ x)$ (D) $y = 2\sin(x)$

_____ 16. Simplify $\frac{1-\sin^2\theta}{\sin\theta} \quad \frac{1}{\cos^2\theta}$

(A) csc(θ) (B) sin(θ) (C) cot(θ) (D) $\cos^2\theta$

_____ 17. Simplify the following: $\frac{\sin(-\theta)}{\cos(-\theta)}$

(A) tan(θ) (B) sin(θ) (C) -tan(θ) (D) -cos(θ)

_____ 18. The horizontal displacement of $y = 4 + 3\cos\left(2\left(x - \frac{\pi}{2}\right)\right)$ is:

(A) 2 (B) 3 (C) 4 (D) $\frac{\pi}{2}$

_____ 19. The expression $\sin(2\theta)\cos(\theta) - \cos(2\theta)\sin(\theta)$ is equivalent to:

(A) sin(3 θ) (B) cos(3 θ) (C) sin(θ) (D) cos(θ)

_____ 20. sin (90° - x) is equal to:

(A) sin(x) (B) cos(x) (C) tan(x)

III. Graph the following on the axes provided:

21. Graph $y = 2 \sin(4x)$

22. Graph $y = \cos(x + 45^\circ)$ for $0^\circ \leq x < 360^\circ$

23. Graph $y = \cot(x)$ for $0^\circ \leq x < 360^\circ$

24. Graph $y = \sec(x)$ for $0 \leq x < 2\pi$

25. Graph $y = 1 + 2\cos 2(x - 90^\circ)$ for $0^\circ \leq x < 360^\circ$

IV. Solve the following equations:

_____ 26. $2\sin x = \sqrt{2}$

_____ 27. Solve $x = \text{Sin}^{-1}\left(-\frac{1}{2}\right)$

_____ 28. Solve $\tan\theta = -\sqrt{3}$

_____ 29. Solve $2\sin^2 x - 5\sin(x) + 2 = 0$ for $0^\circ \le x < 360^\circ$

_____ 30. Solve $2\cos\theta - \sqrt{3} = 0$ for $0^\circ \le \theta < 360^\circ$

_____ 31. Solve $2\cos^2 x - 1 = 0$ for $0^\circ \le x < 360^\circ$

V. Prove the following identities:

32. Prove $\left(1 + \tan^2 x\right)\sin^2 x = \tan^2 x$

33. Prove $\cos^4\theta - \sin^4\theta = 1 - 2\sin^2\theta$

34. Prove $\dfrac{\sin^3 A + \cos^3 A}{\sin A + \cos A} = 1 - \sin A \cos A$

35. Prove $2\cos^2\left(\dfrac{\theta}{2}\right) - \cos\theta = 1$

36. Prove $\sin^2 x \cos^2 x + \cos^4 x = \cos^2 x$

37. Prove $\dfrac{\sec^2 x - 6\tan x + 7}{\sec^2 x - 5} = \dfrac{\tan x - 4}{\tan x + 2}$

VI. Miscellaneous Problems

_____ 38. Convert 100° to radians

_____ 39. Convert $\frac{2\pi}{15}$ to degrees

_____ 40. Determine the value of sec (-2002°)

_____ 41. Determine the value of cot(55°)

_____ 42. Determine the value of cos(.72)

_____ 43. Simplify $(\cos u)(\tan u)$

_____ 44. Which trig functions are positive in the third quadrant?

_____ 45. In which quadrants is the cosine negative?

_____ 46. Determine the quadrant in which the terminal side of an angle of 495° lies.

_____ 47. Given an angle of 190°, what is the measure of the reference angle?

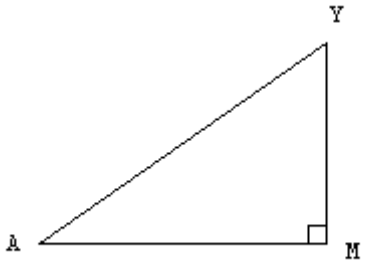
_____ 48. Determine the exact value of $\sin^2\left(\frac{\pi}{6}\right)+\cos^2\left(\frac{\pi}{6}\right)$

_____ 49. Graph the following function on the axes below: $y = \text{Cos}^{-1}x$

_____ 50. Your cat is on a tree branch 12 feet above the ground. If your ladder is 16 feet long, at what angle must it be placed against the tree (so that the top of the ladder is 12 feet above the ground)?

_____ 51. Commercial airliners fly at an altitude of about 3000 feet. If the pilot wants to land at an angle of 3˚ with the ground, at what ***horizontal*** distance from the airport must she start descending?

_____ 52. Find the length of segment MY in the diagram at the right, given that $m\angle A = 26°$ and AY = 15 inches.



_____ 53. What is the range of y = sin (x) ?

_____ 54. What is the domain of y= Arctan (x) ?

_____ 55. Determine the exact value of cos(θ) if θ is in standard position and its terminal side contains the point (-3, -2).

_____ 56. A ship is 80 miles north and 40 miles west of port. If the captain wants to travel directly to port, what bearing should be taken?

_____ 57. Determine the ***exact*** value of:

$$\sin\left(\text{Cos}^{-1}\left(-\frac{4}{5}\right) - \text{Tan}^{-1}\left(-\frac{12}{5}\right)\right)$$

_____ 58. Determine the exact value of cos 15˚

_____ 59. Determine the least positive value of θ such that:

$$\sin^2\theta + \cos^2\theta + \tan^2\theta = \frac{4}{3}$$

_____ 60. If $\sin x + \cos x = \frac{1}{5}$ and $0 < x < \pi$, then tan(x) =

_____ 61. Extra Credit: Express the Arcsec (x) in terms of the ArcTangent