Pre-AP PreCalculus – Fall Semester Exam Review

Only use a calculator for problems with a ** by the directions.

1. Find the exact values of the six trig functions of an angle θ whose terminal side passes through the point (-5, -7).

Find the exact value:

2. $\cos 45^\circ \sin 210^\circ - \sin 30^\circ \cos 135^\circ$
3. $\cot^2 330^\circ - \csc^2 330^\circ$
4. $\dfrac{\sin 120^\circ}{\cos 120^\circ}$
5. $\sin^2 30^\circ + \cos^2 30^\circ + \tan^2 30^\circ - \sec^2 30^\circ$

**Find each value correct to 3 decimal places:

6. $\tan 58.7^\circ$
7. $\csc 4.9^\circ$
8. $\theta = \cos^{-1} 0.9125$
9. $\theta = \cot^{-1} 0.5234$
10. $\sec\theta = -12.84$ and $180^\circ < \theta < 270^\circ$

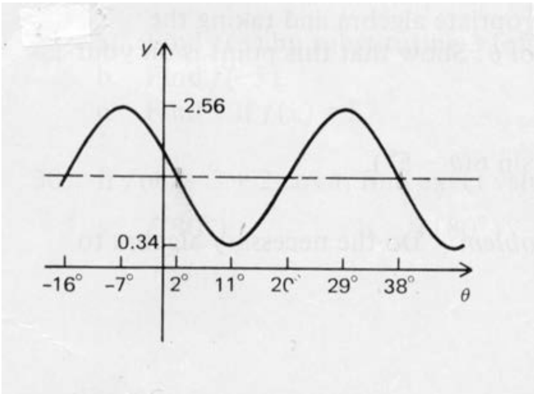
11. Your cat is trapped on a tree branch 6.5 meters above the ground. Your ladder is only 6.7 meters long. If you place the ladder's tip on the branch, what angle will the ladder make with the ground? **
12. Commercial airliners fly at an altitude of about 10 kilometers. They start descending toward the airport when they are far away, so that they will not have to dive at a steep angle. **
    a. If the pilot wants the plane's path to make an angle of 3° with the ground, at what horizontal distance from the airport must he start descending?
    b. If he starts descending a ground distance of 300 km from the airport, what angle will the plane's path make with the horizontal?

Graph 1 period:

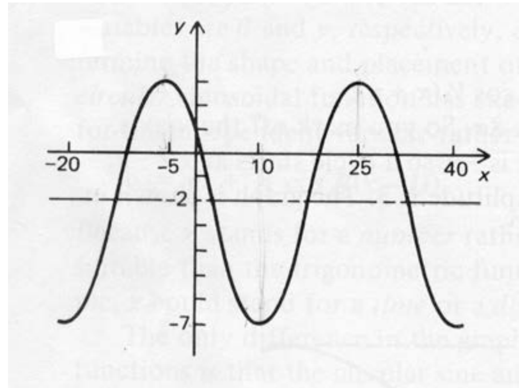
13. $y = -10 + 20\sin 2(\theta + 30^\circ)$
14. $y = 3 + 5\cos\dfrac{1}{2}(\theta + 90^\circ)$
15. $y = 3 + 2\cos\dfrac{1}{5}(x - \pi)$
16. $y = 2 + 6\sin\dfrac{\pi}{4}(x - 1)$
17. $y = -1 + 3\cot 2(\theta - 30^\circ)$
18. $y = 2 + 5\tan\dfrac{\pi}{8}(x - 3)$
19. $y = 4 + 6\sec\dfrac{\pi}{2}(x + 1)$

Write an equation for each graph:

20. (degrees)



21. (radians)



Find the exact value:

22. $\sin\frac{\pi}{2}+6\cos\frac{\pi}{3}$

23. $\dfrac{\cos\frac{5\pi}{3}}{\sin\frac{5\pi}{3}}$

24. Find each value correct to 3 decimal places. **

$$f(x)=5+2\cos\frac{\pi}{4}(x-10)$$

a.) $f(17.3)$

b.) Find the general solutions and the first three positive values for x if $f(x)=6.7$

25. Researchers find a creature from an alien planet. Its body temperature is varying sinusoidally with time. 35 minutes after they start timing, it reaches a high of $120°F$. 20 minutes after that it reaches its next low, $104°F$. **

a. Sketch a graph of this sinusoid.

b. Write an equation expressing temperature in terms of minutes since they started timing.

c. What was the temperature when they first started timing?

d. Find the first 3 times after they started timing at which the temperature was $114°F$.

Prove that each equation is an identity:

26. $\dfrac{1}{1+\cos x}=\csc^2 x-\csc x\cot x$

27. $\dfrac{\sin x}{1-\cos x}+\dfrac{1-\cos x}{\sin x}=2\csc x$

28. $\dfrac{1-3\cos x-4\cos^2 x}{\sin^2 x}=\dfrac{1-4\cos x}{1-\cos x}$

29. If $\sin A = \frac{1}{2}$, $\cos A > 0$, $\tan B = \frac{3}{4}$, *and* $\sin B < 0$, find $\sin(A+B)$.

30. If $\cos A = -\frac{6}{7}$ and A is in Quadrant II, find sin2A, cos2A, and tan2A.

31. If $\cos\theta = -\frac{3}{5}$ *and* $180° < \theta < 270°$, find $\sin\frac{1}{2}\theta$, $\cos\frac{1}{2}\theta$, and $\tan\frac{1}{2}\theta$.

32. **SKIP** Transform $\cos x + \sqrt{3}\sin x$ into a single cosine expression.

Prove that each equation is an identity:

33. $\tan x = \frac{1-\cos 2x}{\sin 2x}$

34. $\tan x \tan\frac{1}{2}x = \sec x - 1$

Solve each equation in its given domain:

35. $2\sin\theta\cos\theta = \sqrt{2}\cos\theta$ $\{\text{real \# degrees}\}$

36. $2\cos^2 x - 5\cos x + 2 = 0$ $[0, 2\pi)$

37. $4\sin x\cos x = \sqrt{3}$ $[0, 2\pi)$

38. $\sin 2\theta\cos 64° + \cos 2\theta\sin 64° = \frac{\sqrt{3}}{2}$ $[0°, 360°)$

Find the exact value in radians:

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

40. $cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

41. $\cos\left(\arcsin\left(-\frac{8}{17}\right)\right)$

42. $\cos^{-1}\left(\sin\frac{7\pi}{6}\right)$

43. A spacecraft is in an elliptical orbit around the earth. At time t=0 hours, it is at its apogee (highest point) d=1000 km above the earth's surface. Fifty minutes later, it is at its perigee (closest point) d=100 km above the surface. Round to three decimal places. **

a.) Write an equation for d in terms of t.

b.) Predict the first 3 positive values for t which the spacecraft is 200 km from the earth.

c.) In order to transmit back to earth, the spacecraft must be within 700 km of the surface. For how many consecutive minutes will the spacecraft be able to transmit?

44. Graph each equation in it's restricted range:

a. $y = \sin^{-1} x$ b. $y = \cos^{-1} x$ c. $y = \tan^{-1} x$

This is a general overview of the trig you have learned this semester <u>excluding</u> unit 6 (oblique triangles of which you may use a calculator.) It would be a good idea to look back over all of your quizzes, homework, and test reviews.