

Pre-AP PreCalculus - Fall Semester Exam Review

Show all work on your own paper. Questions with *** are calculator questions

- 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. $\cos \frac{\pi}{4} \sin \frac{7\pi}{6} - \sin \frac{\pi}{6} \cos \frac{3\pi}{4}$

3. $\cot^2 \frac{11\pi}{6} - \csc^2 \frac{11\pi}{6}$

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

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

6. $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{6} + \tan^2 \frac{\pi}{6} - \sec^2 \frac{\pi}{6}$

- Convert 40° to radians

- Convert $\frac{\pi}{9}$ radians to degrees

- Find a positive and negative angle coterminal to 84°

- If $\sin \theta < 0$ and $\cot \theta < 0$, then θ must lie in which quadrant?

- ***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?

- ***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.

- 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?

- If he starts descending a ground distance of 300 km from the airport, what angle will the plane's path make with the horizontal?

- ***While standing on a cliff 120 feet high, I see a sailboat at an angle of depression of 21° . What is the horizontal distance between the cliff and the sailboat?

Graph 1 cycle. Identify the period, amplitude, vertical shift and phase shift:

14. $y = -10 + 20 \sin 2\left(x - \frac{\pi}{8}\right)$

15. $y = -5 \cos \frac{1}{2}(x + \pi) + 3$

16. $y = 3 + 2 \cos \frac{1}{5}(x - \pi)$

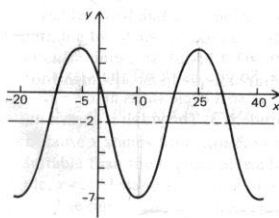
17. $y = 2 - 6 \sin \frac{\pi}{4}(x - 1)$

Write an equation for each graph as both sine and cosine:

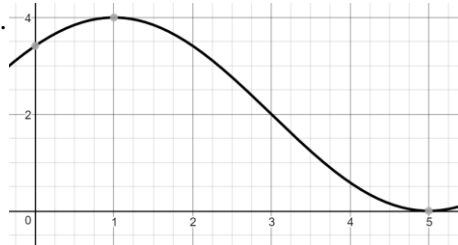
18.



19.



20.



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

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

a.) $f(17.3)$

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

c.) What is the first positive x value that gives the maximum y value?

22. ***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 $120^\circ F$. 20 minutes after that it reaches its next low, $104^\circ F$.

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 $114^\circ F$.

23. *** 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?

24. Graph the parent function for each

a. $y = \tan x$

b. $y = \cot x$

c. $y = \csc x$

d. $y = \sec x$

Find values of x where $0 \leq x < 2\pi$

25. $\cos x = -\frac{\sqrt{2}}{2}$

27. $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = x$

28. $\cos x = -1$

Find the exact value

29. $\sin^{-1}\left(-\frac{1}{2}\right)$

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

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

Prove that each equation is an identity:

32. $\frac{1}{1 + \cos x} = \csc^2 x - \csc x \cot x$

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

34. $\frac{1 - 3 \cos x - 4 \cos^2 x}{\sin^2 x} = \frac{1 - 4 \cos x}{1 - \cos x}$

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

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

37. If $\cos A = -\frac{6}{7}$ and A is in Quadrant II, find $\sin 2A$, $\cos 2A$, and $\tan 2A$.

38. If $\cos \theta = -\frac{3}{5}$ and $180^\circ < \theta < 270^\circ$, find $\sin \frac{1}{2}\theta$, $\cos \frac{1}{2}\theta$, and $\tan \frac{1}{2}\theta$.

Solve each equation in its given domain:

39. $2 \sin \theta \cos \theta = \sqrt{2} \cos \theta$ {real # degrees}

40. $2 \cos^2 x - 5 \cos x + 2 = 0$ $[0, 2\pi)$

41. $4 \sin x \cos x = \sqrt{3}$ $[0, 2\pi)$

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

43. $\sin^2 x + 2 \sin x = 3$ $[0, 2\pi)$

44. $\tan^2 x = 1$ $[0, 2\pi)$

This is a general overview of the trig you have learned this semester excluding 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.