

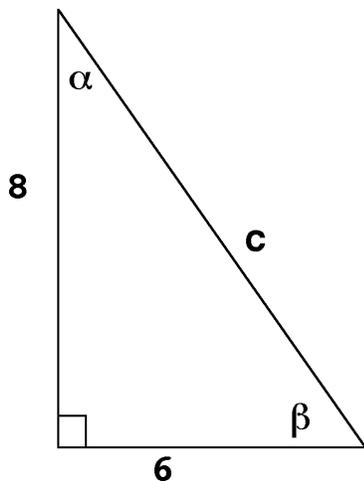
Exam 3 Study Guide, Pre-Calculus

Material Covered:

- Trig functions and solving right triangles. (5.4 and 5.5)
- Graphing trig functions (5.6, 5.7, and 5.8)
- Inverse trig functions (5.9)
- Basic Identities (6.1)
- Sum, difference and co-function identities (6.2)
- Double and half-angle identities (6.3)

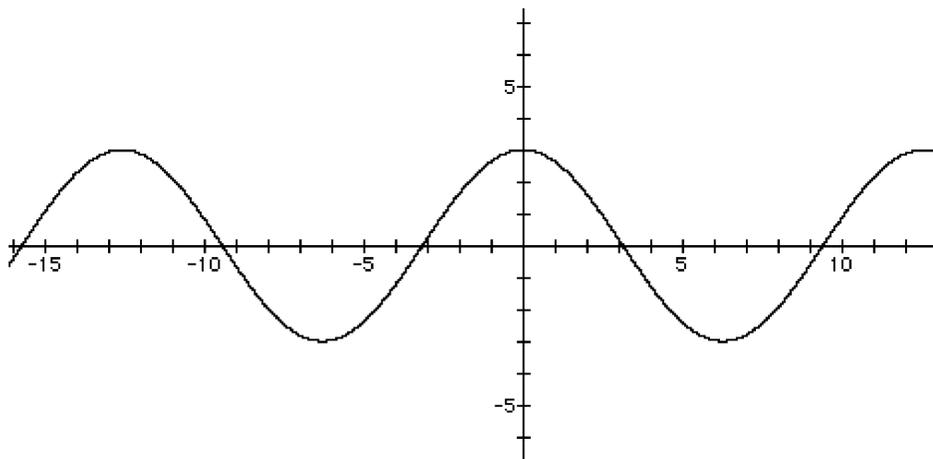
Problems from old exams:

1. Suppose two planes leave Lambert Airport at the same time. One flies due east, the other flies south-east. They fly at 600 mph. How far apart are they after 1 hour? (Show all your work.)



2. Find α , β and c .

3. Sketch the graph of $y = 5 \sin(2x)$.
 Where are the zeros? (Give answer in symbolic notation.)
 Where does the function reach it's maximum? (Again, symbolic notation please.)



4. Find a trigonometric function which has the graph shown above. Explain carefully how you obtained your answer.
5. Graph $y = \tan(x)$ restricted to the interval $(-\pi/2, \pi/2)$. Find the inverse function $y = \tan^{-1}(x)$ graphically. What are the domain and range for $y = \tan^{-1}(x)$? Why did we need to restrict the domain of our original function $y = \tan(x)$?
6. Graph $y = \sin(x)$ restricted to the interval $[-\pi/2, \pi/2]$. Find the inverse function $y = \sin^{-1}(x)$ graphically. What are the domain and range for $y = \sin^{-1}(x)$? Why did we need to restrict the domain of our original function $y = \sin(x)$?
7. To measure the height of a cloud ceiling over an airport, a searchlight is directed straight upward to produce a lighted spot on the clouds. 600 meters away an observer reports the angle of the spot relative the horizontal to be $32'30''$. How high to the nearest meter are the clouds above the airport?

8. (a) State the amplitude A, period P and phase shift of the function and give a sketch of the function over the indicated interval.

$$y = 5 \sin(\pi x + \pi/4) \quad -2 \leq x \leq 2$$

- (b) State the period P and phase shift of the function and give a sketch of the function over the indicated interval.

$$y = 4 \sec(2x - 1/2) \quad -\pi \leq x \leq \pi$$

9. Find an equation of the form $y = A \sin(Bx + c)$ that has the same graph as the function $y = \frac{\sqrt{3}}{2} \sin(x) + \frac{1}{2} \cos(x)$
10. Write the following expression as an algebraic expression in x (i.e. free of trig. and inverse trig. functions)

$$\sin(\arccos x)$$

11. Suppose we have a right triangle whose sides have length 22.5 cm and 10.3 cm. Find the length of the hypotenuse and the measures of the other two angles. (1 decimal accuracy) Draw a picture!
12. Complete the following identities:
- a. $\cos(x + y) =$
 - b. $\sin(x - y) =$
 - c. $\sin^2(x) =$
 - d. $\tan(x) =$
 - e. $\sin(2x) =$
 - f. $\cos(2x) =$
 - g. $\sin(x/2) =$

13. a. Simplify the following expression:

$$\frac{1 - \cos^2 x}{\sin x}$$

b. Combine fractions and simplify

$$\frac{1}{\sin x \cos x} - \frac{\cos x}{\sin x}$$

c. Confirm the identity:

$$\frac{\sec^2 x - 1}{\sin x} = \frac{\sin x}{1 - \sin^2 x}$$

14. Suppose that $f(x) = -2 \sin(3x - \frac{\pi}{3})$. What are the amplitude, period, phasshift, domain and range of this function?
15. Given that $\sin(x) = 3/5$ and $\pi/2 \leq x \leq \pi$, find $\sin(2x)$, $\cos(2x)$, and $\tan(2x)$.
16. Given that $\sin(x) = -1/3$ and $\pi \leq x \leq 3\pi/2$, find $\sin(x/2)$, $\cos(x/2)$, and $\tan(x/2)$.
17. Find an algebraic expression for $\sin(\cos^{-1}(x))$.
18. Find an algebraic expression for $\sec^2(\arctan(x))$.
19. As always: look at all homework and worksheets.