Without using a calculator, evaluate each of the following:

1) $\cos \frac{5\pi}{6}$
2) $\tan \frac{3\pi}{4}$
3) $\sec \frac{5\pi}{3}$
4) $\sin \frac{5\pi}{6}$
5) $\csc \frac{11\pi}{6}$
6) $\cot 0$
7) $\csc \frac{3\pi}{3}$
8) $\sin \frac{11\pi}{4}$
9) $\csc \frac{8\pi}{3}$
10) $\cot \frac{3\pi}{2}$

11. At time $t = 0$ an animal population is at a low of 700. Six months later the population will reach a high of 900, and then go back down to a low of 700 after another six months.

   a) Create a general sketch of this function over 1 year. Label your axis.

   b) Write a possible trigonometric formula using the cosine function that will model this population.

   c) Write a possible trigonometric formula using the sine function that will model this population.
12. If the \( \cot X = \frac{-5}{7} \), and \( \sec X > 0 \), and \( \cos Y = \frac{-2}{5} \), and \( \csc Y > 0 \), then find the value of:

a) \( \cos (X - Y) \).

b) \( \cos (2Y) \) \hspace{1cm} (Leave answers in simplest radical form.)

13. Solve each of the following equations, for \( 0 < \theta < 2\pi \). Express each of your answers exactly.

a) \( \frac{2}{\sec^2 \theta} = 1 - \sin \theta \)

b) \( \sin(2\theta) - \cos^2(\theta) + 1 = \sin^2(\theta) + \sin(\theta) \)
14. For all values of \( x \) for which the expressions are defined, prove the following identity:

\[
\frac{\tan x \csc^2 x}{1 + \tan^2 x} = \frac{1 + \cos x + \cos 2x}{\sin x + \sin 2x}
\]