1) Solve: \[ \frac{3000}{4 + e^{-2x}} = 500 \]

2) Find a, b, and \( \alpha \)

3) If \( f(x) = \frac{1}{x+1} \) and \( g(x) = \frac{x+1}{x-1} \), find \( f(g(x)) \), \( g(f(x)) \)

4) Find the inverse of: \( h(x) = \frac{1-3x}{5+2x} \)

5) Convert the following angle in degree measure:
   a) \( \pi /9 \)
   b) \( -11\pi /30 \)

6) Solve the following:
   \[ \sin x \cos x = -\frac{1}{2} \], \( 0 < x < \pi \)

7) Find the reference angle \( \theta' \) of:
   a) \(-72^\circ\)
   b) \(7\pi /6 \)

8) Solve the following:
   a) \( 6\cos(t) + 4 = 0 \)
   b) \( \sin^2 t + \sin t - 20 = 0 \)
   c) \( \sin^2 \theta + 2 \sin \theta - 1 = 0 \)

9) Find a formula for the following graph:

11) A bacteria culture starts with 9600 bacteria. After one hour the count is 12,000.
   a) Find the formula for the number of bacteria \( n(t) \) after \( t \) hours using an exponential model.
   b) Find the formula for the number of bacteria \( n(t) \) after \( t \) hours using a linear model.
   c) Find the number of bacteria after two hours using the exponential model.
   d) After how many hours will the number of bacteria triple, use the linear model?
   e) Find the inverse function, \( n^{-1}(y) \), from part a) and from part b)

12) Find the amplitude, the period and the phase shift of the function:
   \[ y = 1.2 \cos(2\pi x - \frac{\pi}{2}) \]

13) Solve the following (Find \( \theta \)):
   \[ \sin(2\theta) + \cos(\theta) = 0 \]
14) Find the equation for the following curve:

15) a) $c = 3, b = 4, \gamma = 40^\circ$  
b) $a = 3, c = 7, \alpha = 70^\circ$

16) An airplane flies from city A to city B, a distance of 150 miles, then turns through an angle of $40^\circ$ and heads toward city C. If the distance between A and C is 300 miles, how far is it from city B to city C? Through what angle should the pilot turn at city C to return to city A?

Verify the following identities:

17) a) $\tan \theta \sec \theta = \tan \theta$  
b) $\frac{1 + \cos x}{1 - \cos x} = \frac{\sin^2 x}{(1 - \cos x)^2}$  
c) $\cos^2 x - \sin^2 x = 1 - 2 \sin^2 x$

d) $\frac{1 + \sec x}{\sin x + \tan x} = \csc x$  
e) $\frac{1 - (\sin x - \cos x)^2}{\sin x} = 2 \cos x$

18) Find a formula for the following:

19) Verify that:

   a) $\cos 2x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$  
b) $(\sin x + \cos x)^2 = 1 + \sin 2x$

20) If $P = (-3,4)$ is on the terminal side of an angle in standard position. Find the six trigonometric functions.

21) Two pulleys, one with radius $r_1$ and the other with radius $r_2$, are connected by a belt. The pulley with radius $r_1$ is rotating at an angular speed $\omega_1$ rpm whereas the pulley with radius $r_2$ rotates at $\omega_2$ rpm. Show that $r_1/r_2 = \omega_1/\omega_2$.

22) Find the equation of the line that passes through the point $(1, 7)$ and is perpendicular to the line $x + 2y + 12 = 0$. 