Math 1A

Precalculus Review

Please read the direction for each question carefully. Show all your work on engineering paper.

1. Solve each equation algebraically. **No calculator** may be used to solve these equations. **Exact answers only no decimals.**

   a) $\dfrac{t}{t+1} + \dfrac{5}{t} = \dfrac{1}{t^2+t}$

   b) $\sqrt{3y+1} - 1 = \sqrt{y+4}$

   c) $2x(x+4) = 3(2x-3)$

   d) $5^{2y+1} = 42$

   e) $\log_8(x+6) = 1 - \log_8(x+4)$

   f) $2\cos^2(\theta) - 3\cos(\theta) + 1 = 0$

2. Consider the function $f(x) = (x^2 - 4x - 12) \cdot e^{-x/4}$.

   a) Use your graphing calculator to sketch $f(x)$ in the window $[-3,\ 30]_5 \times [-20,\ 20]_5$.

   b) Find all the zeros for $f(x)$ algebraically, and verify those zeros with your graphing calculator.

   c) Using your graphing calculator, find all extrema for $f(x)$ in the given window. Identify them as relative or absolute.

   d) Find $\lim_{x\to\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$, that is find the right and left-hand behavior for $f(x)$.

3. Use fundamental identities and algebra to prove the following identities.

   a) Prove: $\cos x + \sin x \cdot \tan x = \sec x$

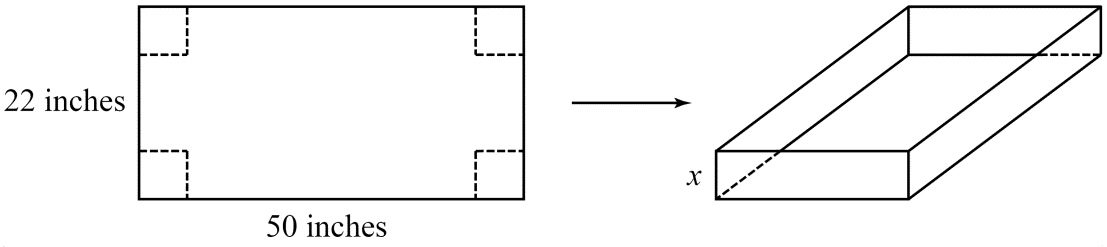
   b) Prove: $\dfrac{\cos\theta \cdot \cot\theta}{1 - \sin\theta} - 1 = \csc\theta$

4. A triangular plot of land has two sides of length 515 feet, and 475 feet with the angle between the two sides of 47°. Determine the following.

   a) The length of the other side and the other two angles of the plot of land.

   b) The area of the plot.

5. An open box is to be made from a piece of sheet metal 22 inches by 50 inches on a side by cutting equal squares from the corners and turning up the sides, see figure below.



   a) Find the dimensions of the box, height, length, and width in terms of x.

   b) Determine the function $V(x)$ and it's domain that would calculate the volume of all such boxes.

   c) Graph your function from part (b) on your graphing calculator. Use your domain from part (c) for the x-min and x-max and use the interval $[0, 2700]_{500}$ for the y-min and y-max. Find the dimensions of the open box and the maximum volume.