Worksheet #11
Math 221

Instructions. Put the first and last name of everyone in your workgroup at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning.

1. Find \( \frac{dy}{dx} \).
   (a) \( y = \ln(\cos x) \)
   (b) \( e^y = \ln x \)
   (c) \( y = x^\sin x \)
   (d) \( y = (x^2 + 1)e^x \)

2. The lemniscate is a figure eight shaped curve described by the equation
   \[
   (x^2 + y^2)^2 = 4(x^2 - y^2) \tag{1}
   \]
   and is used in typography to denote infinity. Find \( \frac{dy}{dx} \) for points on the graph. Are there any points on the curve for which \( \frac{dy}{dx} \) is undefined?

3. At noon, one plane leaves an airport and heads East at 200 miles per hour and another leaves the same airport and heads North at 160 mile per hour. Use implicit differentiation to determine how fast the distance between the two planes is increasing at 2 p.m. Then do the problem directly by finding an explicit formula for the distance between the two planes. Are your results are consistent?