Math 161 In-Class Worksheet 6:
Chain Rule and Implicit Differentiation

Due: Friday, February 28

Instructions

- The problems before the line are due at the beginning of class on the date above. You may turn in a paper copy or submit a Journal (.jnt) or OneNote (.one) file electronically via myGCC (name your file following the convention given on my web page).
- You may only work on this assignment with your group from class.
- **You may only use your group, class notes and handouts, textbook, Mathematica, and me as resources for completing these problems.**
- Every member of the group must understand the solution to each of the problems. If someone in your group doesn't understand something, it is the group's responsibility to help them before moving on.
- For this assignment, each group member must write up their final solutions on their own. While I expect solutions within a group to be quite similar, the write-up should reflect your own writing style and understanding of the solution. You must list the other members of your group at the top of the first page of your write-up.

Problems

For each of the following, find the derivative of the function unless given other directions. Simplify your answers.

1. $r(\theta) = \sin^2(\theta) + \cos^2(\theta)$
2. $h(x) = \csc(\sec(2x+1))$
3. $h(x) = \csc(\sec(2\pi+1))$
4. $y = \cos(3x+2)$. Find $\dfrac{d^8y}{dx^8}$ (hint: look for a pattern).
5. $s(t) = \dfrac{\sin^2(t)(t^2-4)}{\sqrt{1-t}}$
6. $y = \sqrt[5]{(x-1)(2x+2)^4(x-4)}$
7. For each of the following parts, y is defined implicitly as a function of x by the equation
$$x^2 + 4xy + y^2 = 13$$
   (a) Find $\frac{dy}{dx}$. (Note: In any implicit differentiation problem, it's okay to write y' instead of $\frac{dy}{dx}$.)
   (b) Find the equation of the line tangent to the graph at the point $(2, 1)$.
   (c) Find the equation of the normal line to the graph at the point $(-2, -1)$.
   (d) Find $\frac{d^2y}{dx^2}$.
8. $x^4 + y^4 + \cot(y) = \dfrac{1}{y}$. Find $\frac{dy}{dx}$.
9. $\sqrt{x+3y} = \dfrac{x^4}{y^4+1}$. Find $\frac{dy}{dx}$.