MA104 - Differential Calculus
Lesson 9: Product And Quotient Rules

Do "starred" problems at the boards.

1. There is a tendency for students to attempt their own version of the product rule: $(fg)' = f'g'$. This is of course **wrong** (very wrong). If you make this mistake don't feel bad: *Leibniz* himself made that very mistake three centuries ago. Give an example showing that this formula is *not* correct.

2. Find the derivative of $f(x) = \dfrac{\sqrt[4]{x} + 8x^7}{x}$ in two different ways:

   (a) Using the Quotient Rule:

   (b) Simplifying first, then use your method of choice:

3. Differentiate! Do problems 3*, 6, 8*, 12, 15*, 18, and 28 on page 187-188 and 31 on page 220.

4. Find tangent lines! Do problems 31 and 32* on page 188. For #32, convert the quotient to a product and use the product rule to find y'.

5. Compute $\dfrac{df}{dx}$ if $f(x) = (x^2 - 1)\left(\dfrac{x^3 + 3x^2}{x^2 + 2}\right)$.

6. The leaders of a particular country are worried about their food supply. The country is currently producing 50 bushels of rice per acre each year and that figure is rising by 1 bushel per year. The country currently has 1,000,000 acres in rice production but that figure is dropping by 50,000 acres per year.

   (a) How many bushels of rice per year are we losing as a result of the drop in acreage?

   (b) How many bushels of rice per year are we gaining as a result of the increase in productivity?

   (c) Is total rice production rising or falling? At what rate? How is the product rule embedded into your answer?