MA 137 Worksheet #15

1. What is one reason that we might care about implicit differentiation?

2. Use implicit differentiation to find $\dfrac{dy}{dx}$ of the following equations in terms of x and y.

   Then find the tangent line to the graph of the curve at $P(2,1)$.

   1. $\qquad x^2 + y^3 = 5xy - 5$

   2. $\qquad \sqrt{2x + \dfrac{32}{y^4}} = 6$

3. A ventilation tube is connected to an air pump which, when inflating the lung, passes 0.06 cubic meters of air per second into the lungs. How fast is the radius of the lungs increasing when the radius is 0.1 meters, assuming that the human lung can be represented as a sphere?

   (Recall that the volume of a sphere is $V(r) = \frac{4}{3}\pi r^3$.)

4. Two resistors are combined in parallel, as indicated in the diagram below. If the individual resistances are R and S, then the total resistance T of the system satisfies the equation

$$\frac{1}{T} = \frac{1}{R} + \frac{1}{S}.$$

   If the total resistance remains at a constant value of $T = 20$ ohms and S is decreasing at a rate of 2 ohms per minute, how is R changing when $S = 30$ ohms?