1. **(6 points)** Answer the following questions about the ellipse defined by the equation $2x^2 + 3y^2 - 4xy + 6y = -3$.

    (a) **(4 points)** On this curve, find $\frac{dy}{dx}$ in terms of x and y.

    (b) **(2 points)** Find the equation of the tangent line to this curve at $(-2, -1)$.

2. **(14 points)** Answer the questions below:

    (a) **(4 points)** If $w = \sec(\sqrt{x})$, find $\frac{dw}{dx}$.

    (b) **(5 points)** Find $\frac{d}{dt} \cot \frac{t^2}{t-2}$.

    (c) **(5 points)** If $g(x) = e^{x \arctan x}$, find $g'(x)$.

    (d) **(2 point bonus)** Using only the product rule, the chain rule, and algebraic manipulation, derive the quotient rule.

Thursday, October 15, 2009