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Worksheet week 5   Calculus I   Fall 2013

1. The curve $y = \frac{x}{1+x^2}$ is sometimes called a "serpentine" (you can check the graph on a graphing calculator or on wolframalpha.com to see why).

(a) Find the equation of the tangent line to the curve at $x = 0$.

(b) Find the coordinates of the points where the tangent line to the serpentine is horizontal.

2. Find with proof formulas for $(\cot x)'$ and $(\csc x)'$.

3. The following provides a proof for the quotient rule from the product rule.

Let $q(x) = \frac{f(x)}{g(x)}$, be the quotient of two functions $f(x)$ and $g(x)$.

The goal is to get a formula for $q'(x)$ in terms of $f'(x), g'(x), f(x), g(x)$. Proceed as follows:

Start from $q(x) \cdot g(x) = f(x)$. (Why is this true?)

Take the derivative of both sides of the above and use product rule on the left side. Then solve for $q'(x)$ and do a bit of algebra to eventually get the familiar quotient rule formula.