Comments: I figured out a way to use LaTeX a little better for my maths notes. Gummi (or emacs) allows for constant viewing of the pdf output so writing math is made a little less complex.

1 Notes - 15.02.10

1.

$$\frac{d}{dx}\left[ln(8)+3ln(x)\right]=\frac{3}{x}$$

2.

$$\frac{40x(5x^2-3)^3}{(5x^2-3)^4}$$
$$=\frac{40x}{5x^2-3}$$

3. **Reminder Vocab:** To find the derivative implicitly, you find $\frac{dy}{dx}$ by taking the derivative with respect to x $\left(\frac{d}{dx}\right)$

4. **Logarithmic Differentiation** is a different way to differentiate by taking the natural log of both sides. Here is an example.

$$\begin{aligned} y &= \frac{x^2\sqrt{5+x}}{x^3+4} \\ ln(y) &= ln\frac{x^2\sqrt{5+x}}{x^3+4} \\ &= 2ln(x)+\frac{1}{2}ln\left(5+x\right)-ln\left(x^3+4\right) \\ \frac{1}{y}\frac{dy}{dx} &= \frac{2}{x}+\frac{1}{2(5+x)}-\frac{3x^2}{x^3+4}8 \end{aligned}$$

2 Notes - 15.02.11

61. This problem is a (severe) compression of the one from last night, and I skipped the notation of all the horrible algebra.

$$\begin{aligned} y^prime &= \frac{-\frac{x}{x^2+1}*x+\sqrt{x^2+1}}{x^2}+\frac{1+\frac{x}{\sqrt{x^2+1}}}{x+\sqrt{x^+1}} \\ &= \frac{1+x^2}{x^2\sqrt{x^2+1}} \end{aligned}$$

1. There are some interesting things with integrals. This set are indefinite.

$$\int \frac{x^2}{3-x^2} dx = \int -\frac{1}{3} u^(-1) du$$
$$u = 3 - x^3$$
$$du = -3x^2 dx$$
$$\int -\frac{1}{3} u^(-1) du = -\frac{1}{3}\ ln|3 - x^3| + c$$

2.

$$\frac{d}{dx}\Big[x + y - 1 = ln(x^2 + y^2)$$
$$1 + \frac{dy}{dx} = \frac{2x + 2y\ \frac{dy}{dx}}{x^2 + y^2}$$

3 Notes - 15.02.12

1. **Long division** and rewriting are fun. Here is an example of why I am lying.

$$\int \frac{x^3 - 3x^2 + 5}{x - 3}\ dx = \int \left(x^2 + \frac{5}{x-3}\right)$$

$$\int \frac{x^2 - 4}{x}\ dx = \int \left(x - \frac{4}{x}\right)$$

2. **Trig functions** are also just the coolest. 338/31 you are given csc and sec generally so you don't need to worry as much, just let $u = 2x$

4 Notes - 15.02.18

1. **Inverse Functions** are functions found when one switches x and y and solves for y. These require the function they are based on to be 1:1, essentially passing the Horizontal Line Test. An interesting property is that $f(f^{-1}(x)) = x$. This also applies in reverse, $f^{-1}(f(x)) = x$. This is the **Definition of Inverse Functions**.

   Interestingly enough, the graph of a function and its inverse is symmetric over $y = x$. The **Reflective Property of Inverse Functions** states that all points (a, b) on a function have a corresponding point (b, a) on its inverse. To figure this out, use the increasing from derivative thing.

   The existence of an inverse function is based on its being a 1:1 function and its being strictly monotonic on its entire domain. **Monotonic** means that it doesn't change directions. If a function is monotonic, it is guaranteed to be 1:1 and thus will have an inverse.

2. **Guidelines for finding the inverse function:** In order to find if something has an inverse, figure out if it's 1:1 first and then figure out what its inverse is. Finding the inverse is based on swapping x and y.

$$f(x) = x^3 - 6x^2 + 12x$$
$$f'(x) = 3x^2 - 12x + 12$$

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