

Math 131 - February 24, 2015
Solutions

Warm-up Problems

1. Find y' .

(a) $\sin y = x$. $y' = \frac{1}{\cos y}$

(d) $\sec y = x$. $y' = \frac{1}{\sec y \tan y}$

(b) $\cos y = x$. $y' = -\frac{1}{\sin y}$

(e) $\csc y = x$. $y' = -\frac{1}{\csc y \cot y}$

(c) $\tan y = x$. $y' = \frac{1}{\sec^2 y}$

(f) $\cot y = x$. $y' = -\frac{1}{\csc^2 y}$

2. Fun! (Not calculus)

Take any integer (preferably large). Count the number of even digits, odd digits and total digits. Concatenate these to form a new number. Repeat.

For example, start with 9288759. 3 even digits, 4 odd digits and 7 total digits which gives the new number 347. Repeating, 347 has 2 odd digits, 1 even digit and 3 total digits which gives 213. Repeat.....

What happens and why?

Lecture Problems

3. Find the derivatives.

(a) $y = x \tan^{-1} x$. $y' = \tan^{-1} x + \frac{x}{x^2+1}$.

(b) $y = 5 \sin^{-1} 2x - 13 \cos^{-1} x^2$. $y' = \frac{10}{\sqrt{1-4x^2}} + \frac{26x}{\sqrt{1-x^4}}$

(c) $y = \tan^{-1} x \sin^{-1} x$. $y' = \frac{\sin^{-1} x}{x^2+1} + \frac{\tan^{-1} x}{\sqrt{1-x^2}}$

4. $e^y = x$. $y' = \frac{1}{e^y}$

5. (a) $y = \ln(x^2 + 1)$. $y' = \frac{2x}{x^2+1}$

(b) $y = \ln(\cos x + x^2)$. $y' = \frac{-\sin x + 2x}{\cos x + x^2}$

6. (a) $y = x^x$. $y' = (1 + \ln x)x^x$

(b) $y = x^{\sqrt{x}}$. $y' = ((\ln x)/(2\sqrt{x}) + 1/\sqrt{x})x^{\sqrt{x}}$

(c) $y = (\sqrt{x})^x$. $y' = ((\ln x)/2 + 1/2)(\sqrt{x})^x$

7. (a) $y = (x + 3)^3(x - 4)^2$. $y' = (x + 3)^3(x - 4)^2 \left(\frac{3}{x+3} + \frac{2}{x-4} \right)$

(b) $y = \frac{x^5}{(1 - 10x)\sqrt{x^2 + 2}}$. $y' = \frac{x^5}{(1-10x)\sqrt{x^2+2}} \left(\frac{5}{x} + \frac{10}{1-10x} - \frac{x}{x^2+2} \right)$