Math 171 Calculus Handout

Derivative Rules - You do <u>not</u> have to memorize all of these!

GENERAL FORMULAS:

1. $\frac{d}{dx}(c) = 0$
2. $\frac{d}{dx}(x) = 1$
3. $\frac{d}{dx}(x^n) = nx^{n-1}$
4. $\frac{d}{dx}(f(x) \pm g(x)) = \frac{d}{dx}(f(x)) \pm \frac{d}{dx}(g(x))$
5. $\frac{d}{dx}(cf(x)) = c\,\frac{d}{dx}(f(x))$
6. $\frac{d}{dx}(f(x)g(x)) = f'(x)g(x) + g'(x)f(x)$
7. $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$
8. $\frac{d}{dx}(f(g(x))) = f'(g(x))g'(x)$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS:

9. $\frac{d}{dx}(a^x) = a^x \ln a$
10. $\frac{d}{dx}(e^x) = e^x$
11. $\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$
12. $\frac{d}{dx}(\ln x) = \frac{1}{x}$

TRIGONOMETRIC FUNCTIONS:

13. $\frac{d}{dx}(\sin(x)) = \cos(x)$
14. $\frac{d}{dx}(\cos(x)) = -\sin(x)$
15. $\frac{d}{dx}(\tan(x)) = \sec^2(x)$
16. $\frac{d}{dx}(\sec(x)) = \sec(x)\tan(x)$
17. $\frac{d}{dx}(\csc(x)) = -\csc(x)\cot(x)$
18. $\frac{d}{dx}(\cot(x)) = -\csc^2(x)$

INVERSE TRIGONOMETRIC FUNCTIONS:

19. $\frac{d}{dx}\left(\sin^{-1} x\right) = \frac{1}{\sqrt{1-x^2}}$
20. $\frac{d}{dx}\left(\cos^{-1} x\right) = \frac{-1}{\sqrt{1-x^2}}$
21. $\frac{d}{dx}\left(\tan^{-1} x\right) = \frac{1}{1+x^2}$
22. $\frac{d}{dx}\left(\cot^{-1} x\right) = \frac{-1}{1+x^2}$
23. $\frac{d}{dx}\left(\sec^{-1} x\right) = \frac{1}{x\sqrt{x^2-1}}$
24. $\frac{d}{dx}\left(\csc^{-1} x\right) = \frac{-1}{x\sqrt{x^2-1}}$

HYPERBOLIC FUNCTIONS:

25. $\frac{d}{dx}(\sinh x) = \cosh x$
26. $\frac{d}{dx}(\cosh x) = \sinh x$
27. $\frac{d}{dx}(\tanh x) = \text{sech}^2 x$
28. $\frac{d}{dx}(\text{csch} x) = -\text{csch} x \coth x$
29. $\frac{d}{dx}(\text{sech} x) = -\text{sech} x \tanh x$
30. $\frac{d}{dx}(\coth x) = -\text{csch}^2 x$

INVERSE HYPERBOLIC FUNCTIONS:

31. $\frac{d}{dx}\left(\sinh^{-1} x\right) = \frac{1}{\sqrt{1+x^2}}$
32. $\frac{d}{dx}\left(\cosh^{-1} x\right) = \frac{1}{\sqrt{x^2-1}}$
33. $\frac{d}{dx}\left(\tanh^{-1} x\right) = \frac{1}{1-x^2}$
34. $\frac{d}{dx}\left(\text{csch}^{-1} x\right) = -\frac{1}{|x|\sqrt{x^2+1}}$
35. $\frac{d}{dx}\left(\text{sech}^{-1} x\right) = -\frac{1}{x\sqrt{1-x^2}}$
36. $\frac{d}{dx}\left(\coth^{-1} x\right) = \frac{1}{1-x^2}$