Alan Tupaj Vista Murrieta High School Website: www.vmhs.net (Click on "Teachers" then "Alan Tupaj")	Derivative Rules – Implicit, Ln, e AP Readiness Session 2 Answers to examples posted on my website
Derivative Rules	**Examples** : For each function, find $f'(x)$ or $\frac{dy}{dx}$
Implicit Differentiation: Differentiate each variable independently with respect to x. Every derivative of y gets multiplied by $\frac{dy}{dx}$ Group all terms with $\frac{dy}{dx}$ on one side with all other terms on the other side. Factor out $\frac{dy}{dx}$ and divide by the result	$x^2y^2 - 2x = 4 - 4y$ Find $\frac{dy}{dx}$
Derivative of natural log: $\frac{d}{dx}(\ln(u)) = \frac{1}{u}\frac{du}{dx}$ (remember the chain rule)	$f(x) = \ln(3x^2 - 5x + 8)$ Find $f'(x)$
Derivative of e^x : $\frac{d}{dx}(e^u) = e^u \frac{du}{dx}$ Remember to use product or quotient rules if needed	$f(x) = (e^{3x})(\cos(2x))$ Find $f'(x)$
Derivative of log with other bases and exponential function with other bases $\frac{d}{dx}(\log_b(u)) = \frac{1}{u}\left(\frac{1}{\ln b}\right)\frac{du}{dx}$ $\frac{d}{dx}(b^u) = b^u(\ln b)\frac{du}{dx}$	$f(x) = \log_3(\tan x)$ Find $f'(x)$ $f(x) = \frac{5^x}{x^2}$ Find $f'(x)$

Using Log Rules to simplify derivatives:

$\log(ab) = \log a + \log b$

$\log\left(\frac{a}{b}\right) = \log a - \log b$

$\log\left(a^b\right) = b\log a$

Logarithmic Differentiation:

1. Take Ln of both sides
2. Simplify using ln rules
3. Differentiate implicitly

   $\ln y$ becomes $\frac{1}{y}\frac{dy}{dx}$

4. Multiply both sides by y to get $\frac{dy}{dx}$

$f(x) = \ln\left(\frac{(x^4 - 3x^3 + 2)\sqrt{3x^2 - 2x}}{(2x-3)(\sin x)}\right)$ Find $f'(x)$

$y = (\tan x)^{x^2}$ find $\frac{dy}{dx}$