Alan Tupaj Vista Murrieta High School Website: www.vmhs.net (Click on Teachers then Alan Tupaj)	Basic Derivative Rules AP Readiness Session 1 Answers to examples posted on my website
Derivative Rules	**Examples** : For each function, find $f'(x)$
Derivative of a constant: $\frac{d}{dx}(c) = 0$	$f(x) = 3,\ f'(x) = 0$
Derivative of a variable to a power: **Power Rule** $\frac{d}{dx}(x^n) = nx^{n-1}$	$f(x) = x^5,\ f'(x) = 5x^4$ $f(x) = \frac{1}{x^3},\ f'(x) = -3x^{-4}$ $f(x) = \sqrt{x^3},\ f'(x) = \frac{3}{2}x^{\frac{1}{2}}$ $f(x) = \frac{1}{\sqrt[3]{x^4}},\ f(x) = x^{\frac{-4}{3}},\ f'(x) = \frac{-4}{3}x^{\frac{-7}{3}}$
Derivative of the sum or difference of functions: $\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	$f(x) = 2x^3 - 5x^2 + 3x - 8$ $f'(x) = 6x^2 - 10x + 3$
Derivative of a product of two functions: **Product Rule** $\frac{d}{dx}(f(x)g(x)) = f(x)g'(x) + g(x)f'(x)$	$f(x) = (5x^2 - 2)(x^3 + 4x^2 + 3)$ $f'(x) = (5x^2 - 2)(3x^2 + 8x) + (x^3 + 4x^2 + 3)(10x)$ $= 15x^4 + 40x^3 - 6x^2 - 16x + 10x^4 + 40x^3 + 30x$ $= 25x^4 + 80x^3 - 6x^2 + 14x$
Derivative of the quotient of two functions: **Quotient Rule** $\frac{d}{dx}(\frac{f(x)}{g(x)}) = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$	$f(x) = \frac{x^3 - 2x}{3x - 4}$ $f'(x) = \frac{(3x-4)(3x^2 - 2) - (x^3 - 2x)(3)}{(3x-4)^2}$ $f'(x) = \frac{9x^3 - 6x - 12x^2 + 8 - 3x^3 + 6x}{(3x-4)^2}$ $f'(x) = \frac{6x^3 - 12x^2 + 8}{(3x-4)^2}$

Division with Monomial Denominator Distribute the monomial in the denominator	$f(x)=\dfrac{x^5-7x^4+2x^3-x^2+5}{x^3}$ $f(x)=\dfrac{x^5}{x^3}-\dfrac{7x^4}{x^3}+\dfrac{2x^3}{x^3}-\dfrac{x^2}{x^3}+\dfrac{5}{x^3}$ $f(x)=x^2-7x+2-x^{-1}+5x^{-3}$ $f'(x)=2x-7+x^{-2}-15x^{-4}$
Application: Equation of a tangent line Given x_1 , substitute into the function to find y_1 Substitute into the derivative to find m Tangent line: $y-y_1=m(x-x_1)$	Find the equation of the line that is tangent to the function $f(x)=2x^3-3x^2+5$ at $x=2$ $f(2)=2(2)^3-3(2)^2+5=9=y_1$ $f'(x)=6x^2-6x$, $f'(2)=6(2)^2-6(2)=12=m$ $y-9=12(x-2)$ or $y=12x-15$