A.P. Calculus   Name: ______________________________

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Blizzard Bag #1

Learning Objectives.

1) Use rules for deriving fundamental functions to find derivatives.
2) Use rules to find derivatives involving the chain rule.

Review the rules for deriving fundamental functions.

Web reference: http://en.wikipedia.org/wiki/Differentiation_rules

Book reference: Pg.

Chain Rule: Remember that whenever you derive the composition of two functions you must apply the chain rule. Essentially the chain rule says this.

If $h(x) = (f \circ g)(x) = f(g(x))$: This means that the function *f* is composed with *g*.

The Chain rule states that $h'(x) = f'(g(x)) \cdot g'(x)$

Example: Given $h(x) = \cos(x^2 + 2)$

This shows that the function $f(x) = \cos x$ is composed with the function $g(x) = x^2 + 2$. From the Wikipedia page we know that $f'(x) = -\sin x$ and $g'(x) = 2x$ therefore the derivative of $h(x)$ is $h'(x) = -\sin(x^2 + 2) \cdot (2x)$

Example: Given $f(x) = (x^3 + 2x^2)^5$ find $f'(x) =$

The function is composed of the function $g(x) = x^5$ with the function $h(x) = x^3 + 2x^2$ and since $g'(x) = 5x^4$ and $h'(x) = 3x^2 + 4x$ we can combine the two to get our final solution of

$$f'(x) = 5(x^3 + 2x^2)^4 \cdot (3x^2 + 4x)$$

Example: Given $g(x) = \ln(x^4)$ find $g'(x) =$

The function is composed of the function $f(x) = \ln x$ with the function $h(x) = x^4$ and since $f'(x) = \frac{1}{x}$ and $h'(x) = 4x^3$ we can combine the two to get our final solution of

$$g'(x) = \frac{1}{x^4} \cdot 4x^3 = \frac{4}{x}$$

Find the first derivative of the following

1) $h(x) = (3x^2 + 3x)^3$
2) $h(x) = \sin(\pi x)^2$
3) $f(x) = x^6 (2 + 5x)^4$
4) $f(x) = \ln(7x + 5)$
5) $f(x) = e^{4x^2}$
6) Find $\frac{dy}{dx}$ if $y = \ln(x^2 + 1)$