4.1 Day 1

Friday, September 13, 2019 8:15 AM

AP Calculus BC **Section 4.1 – Chain Rule Discovery Activity**

Go to http://www.wolframalpha.com/

In the box at the top, type in "derivative of" and then the function you are trying to differentiate. Then press Enter on your keyboard and watch the magic happen.

Make sure for every example below in the table to predict FIRST then use WolframAlpha to find it for you. Predict one at time, not all once.

Function	Predicted Derivative	Actual Derivative
$y=\sin(5x)$		$5\cos(5x)$
$y=(x^2+4)^{10}$		$10(x^2+4)^9(2x)=20x(x^2+4)^9$
$y=(3x+4)^8$		$2(3x+4)\cdot 3=6(3x+4)$
$y=(x^4-5)^{-2}$		$-2(x^4-5)^{-3}\cdot 4x^3=-8x^3(x^4-5)^{-3}$
$y=\frac{2}{(5x-7)^4}=2(5x-7)^{-4}$		$-8(5x-7)^{-5}\cdot 5=-40(5x-7)^{-5}$
$y=(3x^5+2x^3-11x-90)^3$	$3(3x^5+2x^3-11x-90)^2\cdot(15x^4+6x^2-11)$	$3(3x^5+2x^3-11x-90)^2\cdot(15x^4+6x^2-11)$
$y=\sin^2 x=(\sin x)^2$		$2\sin x\cos x$

Enter this as $(\sin(x))^2$

1. Describe how you would get the derivative of $f(g(x))$? Explain in words how you would do it.

Take the derivative of the "outside" evaluate at the "inside" times the derivative of the "inside"

2. Can you come up with a generalized rule for the derivative of a composition of functions using f, g, and x?

$f(g(x)) \neq f(x)\cdot g(x)$

$$\frac{d}{dx}(f(g(x)))= f'(g(x))\cdot g'(x)$$

Ex: Find $\frac{dy}{dx}$ of $y=\cos(x^3+3x-4)$

$$\frac{dy}{dx}=-\sin(x^3+3x-4)\cdot(3x^2+3)$$

$y=(4x^3-5x^4+3)^5$

Ex Diff. $y = (4x^3 - 5x^4 + 3)^5$

$= 5(4x^3 - 5x^4 + 3)^4 (12x^2 - 20x^3)$

Ex. Diff $r = \sec(2\theta)$

$\frac{dr}{d\theta} = \sec(2\theta)\tan(2\theta) \cdot 2$

ex: Diff $y = 6(\sin(x^2+2))^3$ $\frac{dy}{dx} = 18(\sin(x^2+2))^2 \cdot \cos(x^2+2) \cdot 2x$

you try. diff.

a. $y = 6(x^4 - 3x + 2)^7$

$\frac{dy}{dx} = 42(x^4 - 3x + 2)^6 (4x^3 - 3)$

b. $y = 9(\tan(x^3 - 2x))^4$

$\frac{dy}{dx} = 36(\tan(x^3 - 2x))^3 \cdot \sec^2(x^3 - 2x) \cdot 3x^2 - 2)$