AP Calculus AB Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lesson 4-1: *Chain Rule* Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Learning Goal:**

* *I can use the chain rule to compute derivatives.*

The Power Rule for computing derivatives states that .

Often times, functions are made up of compositions and are not quite as simple as the above example.

For instance consider the following:

 If , find .

Using strictly the power rule, our derivative would be calculated as follows:



So 

Let’s use our calculator to check if we are correct.

If , find using your calculator.



Are your answers for the same???

How far off are they? Why are the answers not equal?

Based on what you discovered above, for a *function*  (as opposed to just a *variable* *x*),

 How does the rule need to be adjusted?

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How is the chain rule like a peanut M&M? <https://m.youtube.com/watch?v=WCxIMdFilo0>

Use what you have discovered above to find  for the following functions. Evaluate both on your calculator and using your derivative to check if you are correct.

1.  2. 

3.  4. 

**The Chain Rule**

If is differentiable at the point , and *g* is differentiable at *x*, then the composite function  is differentiable at *x* and



“Derivative of the outside times the derivative of the inside”

Using a different notation, if and , then



\*\*\*The  notation will be extremely useful later in the year when we discuss antiderivatives.

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**Example 1**

Let . Find using the **Chain Rule**. Verify by distributing and using the Power Rule.

**Example 2**

Let . Find .

  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Practice #1 Practice #2**

Let . Find . Let. Find .



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**Practice #3 Practice #4**

**.** Find **. .**

**Practice #5 – A three link chain**

Find the derivative of 

   = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Practice #6**

a.) If , find . b.) If , find *y.*

\*\*\*2017 Exam

