

## MT 1800 Calculus I Worksheet 3.4 – The Chain rule

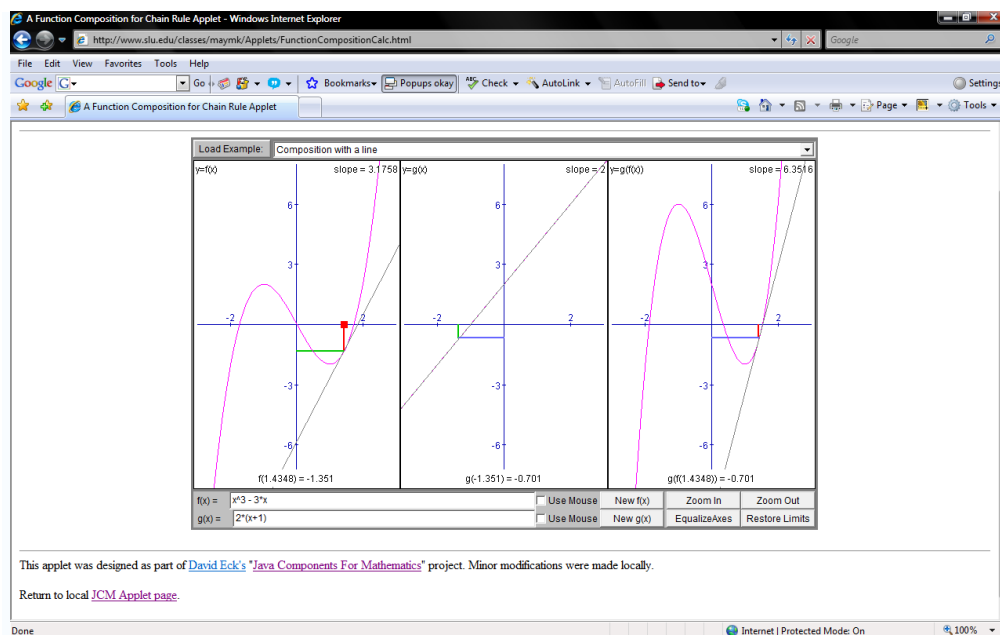
*Purpose:* Find a rule to obtain the derivative of a composition of functions (chain rule) and get some practice using the new rule.

The **Chain Rule** is used to find the derivatives of compositions of differentiable functions.

Open your internet browser to the page:

<http://www.slu.edu/classes/maymk/Applets/FunctionCompositionCalc.html>

In the topmost window find **composition with a line**. Click on “load example”. You should see the following window:



If you position the arrow on the red square you can drag the tangent along the functions.

Focus on the functions and their values

- What function is in the first window?
- What function is in the second window?
- What function is in the third window? Describe how you can get the values of this function from the information in windows 1 and 2.

Now look at the slopes of the tangent lines at the different points whose values appear on the top right of each window.

- Describe carefully how one could compute the derivative of  $g(f(x))$  at  $x = -0.51$ .
- How do the slopes in the first two functions determine the slope of the composition? Conjecture about a formula for the composition of functions given in the example
- Conjecture about a general formula to find the derivative of a composition of functions at a point.
- Test your conjecture in c. using one of the other examples available on the applet.

**Show your work to your instructor before you continue to the next section of the worksheet.**



Use the chain rule to compute the derivatives of each of the following functions. You do not need to simplify.

a.  $y = (4x + 6)^{100}$

b.  $f(x) = e^{5x}$

c.  $g(x) = \sqrt[3]{x^2 + 5x + 3}$

d.  $h(x) = x \cdot e^{x^2}$

e.  $s(t) = \frac{t}{\sqrt{t+t^2}}$

