

**Problem 1 – Derivative Using the Power Rule**

Recall the Power Rule $\frac{d}{dx}(x^n) = n \cdot x^{n-1}$.

1. Based on the Power Rule, what do you think the derivative of $f(x) = (2x + 1)^2$ is?

Type your conjecture in the Math Box on page 1.2 and press **enter**. On page 1.4, you will see the graph of the derivative of $f(x)$. To see if your conjecture for the derivative appears correct, press **tab** until the cursor appears in the function edit line. Scroll up or down until **f3(x)** appears in the function edit line. Press **enter**. If the graphs coincide, then your conjecture may be correct.

2. Does your conjecture appear to be correct? If not, how can you change your conjecture?
3. Expand the binomial $(2x + 1)^2$. Take the derivative of each term. How does this compare with your answer to Question 1?

Problem 2 – The Chain Rule

On page 2.2, you will see several true statements involving various derivatives.

4. What patterns do you see with the derivatives on page 2.2? Using any information that you can infer from the statements on page 2.2, create a rule for finding the derivative of these functions.
5. Using your rule from Question 4, what is $\frac{d}{dx}((3x+2)^2)$? Type your answer on page 2.5 and press **enter**. Were you correct? If the handheld does not return the word 'true,' try again by pressing **del** and changing your answer.
6. What is $\frac{d}{dx}((7x+2)^3)$? Enter your answer on page 2.5 and press **enter** to see if you are correct.

7. What is $\frac{d}{dx}((5x^2 + 2x + 3)^4)$? Enter your answer on page 2.5.

The derivative rule you have just observed is called the **Chain Rule**. It is used to take the derivative of composite functions. The Chain Rule is $\frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x)$. First, take the derivative of the “outside function” at $g(x)$. Then, multiply this by the derivative of the “inside function.”

8. Use the Chain Rule to create three additional true statements. Enter your statements on page 2.7 to see if they are true.

Problem 3 – Homework Problems

Evaluate the following derivatives using the Chain Rule. Enter the statements on pages 3.2–3.6 to see if you are correct.

1. $\frac{d}{dx}((4x^3 + 1)^2) =$

2. $\frac{d}{dx}((-5x + 10)^7) =$

3. $\frac{d}{dt}((2t^5 - 4t^3 + 2t - 1)^2) =$

4. $\frac{d}{dx}((x^2 + 5)^{-2}) =$

5. $\frac{d}{dz}((z^3 - 3z^2 + 4)^{-3}) =$