



### Introducing the Chain Rule

The rules for the differentiation of the standard function forms are readily derived by using methods such as the definition of a derivative. More complicated forms, however, require a little more work. In this activity, we consider composite functions of the form  $f(g(x))$ .

To differentiate composite functions, we use the Chain Rule. The Chain Rule is as follows:

If  $y = f(u)$  and  $u = g(x)$  are both differentiable, then  $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$ .

1. Use the Chain Rule to find the derivative of  $y = \sin(x^2)$ .

Use the spreadsheet on page 2.3 to check your answer. Enter each step in Column B. The Xs will turn into  $\checkmark$ s if you have entered a correct expression. If you do not see a  $\checkmark$ , then check your work and try again.

2. Find the derivative of  $\sin(x)^2$  by hand. Then check your answer using page 2.3.

3. Differentiate:  $\frac{d}{dx}(\ln(x^2))$

4. Differentiate:  $\frac{d}{dx}(\sin(\tan(x)))$

5. Clearly describe this method for a composite function,  $y = f(g(x))$ .