Exploration 14A: Finding the Derivative of a General Power Function

Using the file “C14 PowerDerivative.xls” try to determine the shortcut derivative rules for general power functions. Phrase each of your rules as a sentence like the one in italics in example 13.A.2. The tables below may help you to organize your results in order to make sense of them. For each, you should probably use *h* = 1E-6 or smaller.

A. Start with changing *A* and see what that does. Complete the following table to help you record your observations and make conjectures about the general form of the derivative of the function .

|  |  |  |  |
| --- | --- | --- | --- |
| *A* | *B* | *F(x)* | *F’(x)* |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Your sentence describing the shortcut rule

B. Now set *A* = 1 and see if you can find the derivative rule for . Start with integer powers of *B* to find the pattern, then test your pattern for non-integer values of *B*. You may need to delete the row containing *x* = 0.0 from the data table in order to use the appropriate trendline.

|  |  |  |  |
| --- | --- | --- | --- |
| *A* | *B* | *F(x)* | *F’(x)* |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Your sentence describing the shortcut rule

C. Finally, try to combine your rules above to find the general shortcut rule for the derivative of the function .

|  |  |  |  |
| --- | --- | --- | --- |
| *A* | *B* | *F(x)* | *F’(x)* |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Your sentence describing the shortcut rule

D. For the ultimate challenge, try to find out what the derivative rule for polynomials is. Start with a simple one, like  and see if you can figure out what happens.

(Hint: Polynomials are really just sums of power functions with non-negative integer powers.)