nDerive v2.0 (April 9, 2011)
by Rob Bradley

Thank you for using this nth derivative solver

The solver operates on the formula:

$$f^{(n)}(x) = \lim_{h \to 0} \frac{\sum_{i=0}^{n} (-1)^{n-i} \binom{n}{i} f(x + ih)}{h^n}$$

Derived from the simple derivative formula:

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

The program prompts the user for four (4) inputs:

$f(x)$, the original function, placed in double quotes (e.g. "x^2")
x, the value of the independent variable of the function
n, the nth derivative to find
e, epsilon, the level of accuracy involved in dividing very close to, but not at, zero

$h = \pm 10^{-e}$, where e is the level of accuracy and h is the approximation of the infinitesimal distance $x_n - x_{n-1}$

Because we cannot divide by zero, the program compares the derivatives from both sides as the limits approach zero

Right side:

$$f^{(n)}(x) = \lim_{h \to 0^+} \frac{\sum_{i=0}^{n} (-1)^{n-i} \binom{n}{i} f(x + ih)}{h^n}, h > 0$$

Left side:

$$f^{(n)}(x) = \lim_{h \to 0^-} \frac{\sum_{i=0}^{n} (-1)^{n-i} \binom{n}{i} f(x + ih)}{h^n}, h < 0$$

Known bugs:
-Returning zero (0) for the derivative of some functions with infinite derivatives (e.g. "e^x") if the level of accuracy is too high

-Divide by zero errors if the level of accuracy is too high

-Accuracy is not guaranteed