

DIFFERENTIATION OF ABSOLUTE VALUES

Definition: $|x| = \sqrt{x^2}$

$$\frac{d}{dx} |x| = \frac{d}{dx} (x^2)^{1/2}$$

$$f(x) = \sqrt{x}, \quad g(x) = x^2$$
$$|x| = f(g(x))$$

$$= (1/2) (x^2)^{-1/2} \frac{d}{dx} (x^2)$$

$$= (1/2)(x^2)^{-1/2} (2x)$$

$$= x / ((x^2)^{1/2})$$

$$\frac{d}{dx} |x| = \frac{x}{|x|}$$

Nderiv(function, X, X, ΔX)

$$\text{Limit}_{h \rightarrow 0} \frac{f(X+h) - f(x-h)}{2h} = \frac{dy}{dx}$$

Given: $Y_1 = |X|$

Let: $Y_2 = \text{NDeriv}(Y_1, X, X, 0.001)$

Find: dy/dx when $X = 0$

$dy/dx = 0.$ **WRONG!**

Although the answer is wrong, it is a correct numerical value using the calculator's algorithm