A method to smooth functions

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ABSTRACT. This is a method to analytically smooth functions. It involves taking a multiple integral from $x - \delta$ to $x + \delta$. The smoothing amount is denoted by δ.

Keywords: up, to, six, keywords

1. SMOOTHING

Smoothing functions involves decreasing their jaggedness. Examples of jagged functions include $|x|$ and the Heaviside function. Other functions like polynomials can be considered to not be smooth if they have a large second derivative at their extrema.

The method for smoothing involves taking an integral from $x - \delta$ to $x + \delta$. This can be repeated to increase the smoothing quality. The method is given in Equation 1.1.

$$(1.1) \qquad \int_{x-\delta}^{x+\delta} \cdots \int_{x-\delta}^{x+\delta} f(x) dx$$

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2. Results

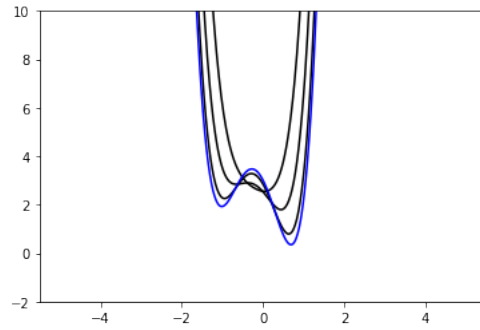These are the results of the operation when applied to some functions.

Figure 1. $y = 4.3x^4 + 3.5x^3 - 5.2x^2 - 3.33x + 3$ with 10 iterations. $\delta = 0, 0.1, 0.2, 0.3$
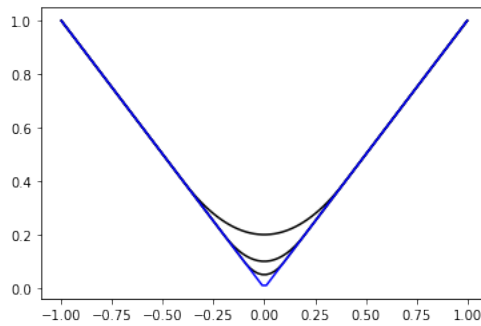

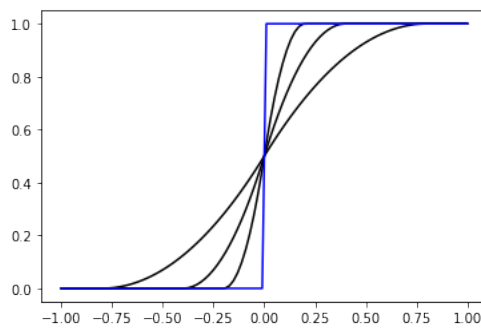**Figure 2.** $|x|$ with 2 iterations. $\delta = 0, 0.1, 0.2, 0.4$

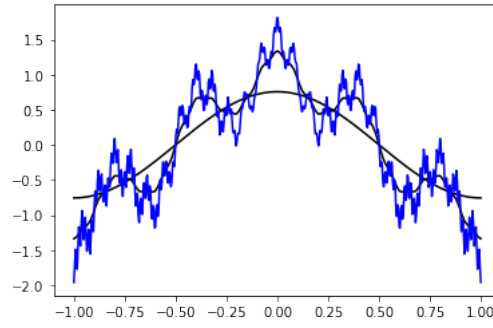**Figure 3.** $Heaviside(x)$ with 2 iterations. $\delta = 0, 0.1, 0.2, 0.4$

Figure 4. $W(x), a = 0.5, b = 5$ with 1 iteration. $\delta = 0, 0.1, 0.4$

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