Phys338/Homework #3

Due on Monday 5/10/2020

1) (a) Derive the formula

$$f''(x) = \frac{f(x - 2h) - 2f(x - h) + f(x)}{h^2}$$

(b) What is the order of the error term.

2) Write a code to calculate the numerical derivative for the function $f(x) = 1 + \tanh(x)$ for $-4 \le x \le 4$ using (a) two points formula (b) three points formula (c) five points formula for $h = 0.1, 0.01$ and 0.001. Plot numerical derivatives and the analytic derivative on the same plot for each formula and h value (i.e. 9 figures). Discuss your results.