Number Representation

* Discuss these questions with your partner and post your solutions on Piazza.

- What is the largest positive integer in an 8-bit 2's complement representation?
- What is the smallest negative integer in an 8-bit 2's complement representation?
- What is the smallest positive number in ~~an~~ 32-bit IEEE 754 representation? [You can express this in powers of 2 if you want to.]
- What is the largest positive number and the smallest negative number in a 32-bit IEEE 754 representation?

Representing Functions

- We can mathematically model complicated functions using simpler functions like polynomials.
- If $f(x)$ is an infinitely differentiable function at point x_0 then we can compute what the function will be at x.

$$f(x) = f(x_0) + f'(x_0)(x-x_0) + \frac{f''(x_0)}{2!}(x-x_0)^2 + \dots + \frac{f^n(x_0)}{n!}(x-x_0)^n + \dots$$

- Taylor Series

$$f(x) = \sum_{k=0}^{\infty} \frac{f^{(k)}(x_0)}{k!}(x-x_0)^k.$$

- Maclaurin Series: Special case of the Taylor series when $x_0 = 0$.

Domain of Convergence.

- If we know how a function behaves at x_0 can we compute the value of the function at any x?

No, there is a domain of convergence where the Taylor Series can be applied but not beyond. This domain is determined by the function and the initial value x_0.

Approximation Error

- The approximation error in a truncated Taylor series is roughly proportional to the size of the next term.