MA 231, Guided Notes §2.1*b*

Recall:

Def: The derivative of f at $x = c$ is defined as

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

provided the limit exists. In such a case the function is said to be **differentiable at** c. Otherwise the function is **not differentiable at** c

- $f'(c)$ represents the *instantaneous rate of change* of the function $y = f(x)$ at $x = c$.
- The units for $f'(c)$ are always equal to the "y-units/x-units."
- Graphically, the derivative at a point is the slope of the **tangent line** to the function's graph at that point.

Def: Given a differentiable function, $y = f(x)$, the **derivative function**, $f'(x)$ is given by

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

1 Examples

Example graph:

From last time:

Example 6: Find the tangent line to the function $f(x) = \frac{1}{x}$ at the point $x = 1.5$.

(Last time we showed that $f'(x) = \frac{-1}{x^2}$.)

Example 1: Find the derivative function for $f(x) = \frac{1}{\sqrt{x}}$.

Example 2: Find the derivative for $f(x) = \sin(x)$.