MATH 133 – Calculus with Fundamentals 1
The Derivative of a Function
October 16, 2017

Background

We are now ready to begin Chapter 3 in our textbook. In the video for today's class, we introduced the *derivative* of a function f at $x = a$ in the domain of f:

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

provided the limit exists. If the limit does exist, then by what we said in Section 2.1, $f'(a)$ will give the slope of the tangent line to the graph $y = f(x)$ at the point $(a, f(a))$. If x represents time, and $f(x)$ is a position, then $f'(a)$ would be the instantaneous velocity.

All the techniques we learned in Chapter 2 for computing indeterminate form limits were, in fact, *set up to compute the limits giving* $f'(a)$(!) Let's practice (and review) some of those techniques!

Questions

(1) Compute $f'(1)$ for $f(x) = x^3 + 2x + 1$ and use your result to find the equation of the tangent line to the graph $y = x^3 + 2x + 1$ at the point $(1, 4)$.

(2) Compute $f'(3)$ for $f(x) = \sqrt{x+1}$ and use your result to find the equation of the tangent line to the graph $y = \sqrt{x+1}$ at the point $(3, 2)$.

(3) Compute $f'(2)$ for $f(x) = \frac{1}{x}$ and use your result to find the equation of the tangent line to the graph $y = \frac{1}{x}$ at the point $(2, 1/2)$.