MAT1193 – 5d Derivative Rules for the exponential function and the natural log

Remember that there are three perspectives that we can take on each of our rule for the derivative: 1. The derivation of the rule; 2. An intuition for the rule; 3. The application of the rule. For the exponential and natural log functions, we’ll only present the rule (step 3). So all you need to do is to know the two rules – you do not need to read section 2.8 in the book.

The rule for exponential function is

\[ f(x) = e^x \rightarrow f'(x) = e^x \]
\[ f(x) = e^x \rightarrow \frac{df}{dx} = e^x \]

In other words, the function \( e^x \) is its own derivative. This is the only function that

has this property and in fact is where the value \( e \) comes from.

The derivative rule for the natural log function is

\[ f(x) = \ln(x) \rightarrow f'(x) = \frac{1}{x} = x^{-1} \]
\[ f(x) = \ln(x) \rightarrow \frac{df}{dx} = \frac{1}{x} = x^{-1} \]