Quiz 8
MATH 1A Fall 2015

19 November 2015

Exercise 8.1. State the fundamental theorem of calculus.

Solution. The fundamental theorem consists of the following two statements. If F is a differentiable function and f is an integrable function, then

$$\int_a^b \left(\frac{d}{dt} F(t) \right) dt = F(b) - F(a)$$

and

$$\frac{d}{dx} \left(\int_a^x f(t) dt \right) = f(x).$$

$\square$

Exercise 8.2. Evaluate

$$\int_0^{\ln x} t^3 dt.$$

Proof. An antiderivative of t^3 is $t^4/4$, so we can evaluate

$$\int_0^{\ln x} t^3 dt = \left[\frac{t^4}{4} \right]_{t=0}^{t=\ln x} = \frac{(\ln x)^4}{4}.$$

$\square$