University of Michigan
Student Name:

Math 115 Quiz 10

Section 9 - Winter 2011
Instructor: Jose Gonzalez
Date: April 15 / 2011

---

(1) Let $q(x) = (1+e^{-x})^{-1}$

a) Calculate the derivative $q'(x)$. No need to simplify.

Solution

$$q'(x) = (-1)(1+e^{-x})^{-2}(-e^{-x}) = \frac{1}{e^x(1+e^{-x})^2}.$$

b) Imagine inserting your answer from part a) into the integral below. What does the fundamental theorem of calculus tell you about the integral? You need not calculate a value.

$$\int_{-1000}^{1000} \text{(answer from part a)}\ dx =$$

Solution

Using the Fundamental Theorem of Calculus, we obtain

$$\int_{-1000}^{1000} \frac{1}{e^x(1+e^{-x})^2}\, dx = \int_{-1000}^{1000} q'(x)\, dx = q(1000) - q(-1000) = (1+e^{-1000})^{-1} - (1+e^{1000})^{-1}.$$

(2) $\int_3^9 (5-2f(x))\, dx = 22$. Find $\int_3^9 f(x)\, dx$.

Solution

We have

$$\int_3^9 (5-2f(x))\, dx = \int_3^9 5dx - 2\int_3^9 f(x)\, dx = 30 - 2\int_3^9 f(x)\, dx.$$

Then $30 - 2\int_3^9 f(x)\, dx = 22$. We solve for $\int_3^9 f(x)\, dx$, and we obtain

$$\int_3^9 f(x)dx = 4.$$