(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

\[
\int_{3}^{9} (5 - 2f(x)) \, dx = \int_{3}^{9} 5 \, dx - 2 \int_{3}^{9} f(x) \, dx = 30 - 2 \int_{3}^{9} f(x) \, dx.
\]

Then \( 30 - 2 \int_{3}^{9} f(x) \, dx = 22 \). We solve for \( \int_{3}^{9} f(x) \, dx \), and we obtain

\[
\int_{3}^{9} f(x) \, dx = 4.
\]