1. (7 pts) Let $q(x) = (1 + e^{-x})^{-1}$

a) (4 pts) Calculate the derivative $q'(x)$. No need to simplify.

$$q'(x) = \frac{-(1+e^{-x})'}{(1+e^{-x})^2} \quad \text{(power law)}$$

$$= \frac{-(-e^{-x})}{(1+e^{-x})^2} \quad \text{(exponential/chain rule)}$$

$$= e^{-x}/(1+e^{-x})^2$$

b) (3 pts) 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.

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

$$= q(1000) - q(-1000)$$

$$\text{or,} \quad = (1 + e^{-1000})^{-1} - (1 + e^{1000})^{-1}$$

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

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

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

$$\text{solving,} \quad 2\int_3^9 f(x)\,dx = 30 - 22 = 8$$

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