1. Following our proof from class, show that \( \ln(x^p) = p \ln(x) \) for \( p \) rational and \( x > 0 \). (Hint: create a function and use properties of the natural logarithm to show that it is always equal to 0.)

2. Evaluate the integrals:
   
   (a) \( \int e^{5x} \left( \frac{e^{2x}}{2} + \frac{8}{e^{3x}} \right) dx \)

   (b) \( \int e^5 \frac{1}{x \ln(x)} dx \)

   (c) \( \int \sqrt{e^{3x} + e^{2x}} dx \) (Hint: change the form of the integral.)
3. Let \( y = \frac{x^3(x^4 + 16)^4}{\sqrt{x^2 + 4}} \). Use logarithmic differentiation to find \( y' \).

4. Let \( f(x) = 5e^{2x} - 4e^{-x} \). Show that \( f \) is one-to-one and evaluate \( (f^{-1})'(1) \).

5. Let \( f(x) = x^2e^{-x} \). Find the intervals on which \( f \) is increasing; find the intervals on which \( f \) is decreasing; find and classify the local extreme values of \( f \).