1. Find the derivative of \( f(x) = (e^x - e^{-x^2})x^3 \)

   **Solution.** Using the product rule (see page 229 of the text), we have

   \[
   f'(x) = \frac{d}{dx}(e^x - e^{-x^2})x^3 + (e^x - e^{-x^2})(x^3)
   = (e^x e^{-x^2}(-2x))x^3 + (e^x - e^{-x^2})e^{-x^2}(3x^2)
   = (e^x + 2xe^{-x^2})x^3 + 3x^2(e^x - e^{-x^2})
   = x^2[(e^x + 2xe^{-x^2})x + 3(e^x - e^{-x^2})]
   \]

2. Solve \( 3e^{4a+1} = 12 \) for \( a \).

   **Solution.** First, we have

   \[
   e^{4a+1} = \frac{12}{3} = 4
   \]

   and next, we apply \( \ln \) to both sides to get

   \[
   \ln(e^{4a+1}) = \ln 4
   \]

   \[
   4a + 1 = \ln 4
   \]

   \[
   4a = (\ln 4) - 1
   \]

   \[
   a = \frac{(\ln 4) - 1}{4}.
   \]

   Thus, \( a = ((\ln 4) - 1)/4 \).