Calculus 3.7 - Derivatives of Logarithmic Functions

Review Problems

1. **Working with logarithms.** Evaluate the following logarithms or state that the value is undefined:
   (a) \( \log_{16} 4 = \)  
   (b) \( \log_6 1 = \)  
   (c) \( \log_{-2} 4 = \)  
   (d) \( \ln(e) = \)  
   (e) \( \log_{32} \left( \frac{1}{2} \right) = \)

2. Write in condensed form: \( 3 \ln(2) - \ln(z) + \ln(x + 1) \)

3. Write in expanded form: \( \ln \left( \frac{\sqrt{x + 4}}{y^3 z^7} \right) \)

4. **Finding derivatives.** Find derivatives of the following functions:
   (a) \( f(x) = x^2 + e^{3x} - \sqrt{4x^3 + 5} \)
   (b) \( g(x) = x^3 \sin^2(x) \)

**Basic Knowledge**

5. Find derivatives of the following functions:
   (a) \( f(x) = \ln(3x^2 - 4) \)
   (b) \( g(x) = \sin(\ln(2x - 1)) \)
   (c) \( h(x) = x^2 \ln(x) \)
   (d) \( p(x) = \ln \left( \frac{(3x^2 - 4)^4}{(5x + 7)^3} \right) \)

**Intermediate Knowledge**

6. Find the equation of a line tangent and the equation of a line normal to the graph of \( y = x \ln(x) \) at point \( x = e \).

**Advanced Knowledge**

7. Find \( f^{(3)} \), where \( f(x) = \ln(\sin(x)) \).

8. Find the formula for the derivative of \( f(x) = \log_a(x) \)