1. Find the derivative of each.
   a) \( f(x) = e^{x^2 - 3x + 7} \)
   
   b) \( f(x) = 3^{\sqrt{x}} \)
   
   c) \( f(x) = \ln \left[ \frac{(x^4 + 2x)}{(e^x + 12)^3} \right] \)
   
   d) \( f(x) = \frac{e^{5x}}{x^2 + 7} \)
3. \( f(x) = (x + 2)^2 (x - 1)^3 \).

a) Find and simplify \( f'(x) \). List the \( x \)-values where the tangent line is horizontal.

b) Make a sign chart for \( f'(x) \). On what intervals is \( f \) increasing? decreasing? Locate any local max or min of \( f \).
4. \( f(x) = \frac{x}{(x^2 + 75)^2} \).

a) Find and simplify \( f'(x) \).

b) Make a sign chart for \( f'(x) \) and find the intervals on which \( f \) is increasing and on which \( f \) is decreasing. Locate any local max or min of \( f \).
5. Courtesy Barnett, Ziegler and Byleen. The cost per hour for fuel to run a train is \( \frac{v^2}{4} \) dollars where \( v \) is the velocity of the train in miles per hour. Other costs total $300/hour. How fast should the train travel on a 360 mile trip to minimize the total cost for the trip? 

Hint: The total number of hours for the trip is \( \frac{360}{v} \).