1. Consumer demand for the Roland portable hair dryer is given by
   \[ D(p) = \frac{1}{5}(225 - p^2) \quad (0 \leq p \leq 15) \]
   measured in units of a hundred, where \( p \) is the unit price in dollars.

   (a) Calculate the elasticity of demand.

   (b) If the unit price is lowered slightly from $10, will the revenue increase or decrease?

   (c) If the unit price is increased slightly from $8, will the revenue increase or decrease?

2. Find the derivative of each function. You do not need to simplify.

   (a) \( f(x) = \log_2(4 - 5x^3) \)

   (b) \( g(x) = e^{\sqrt{8x^2 - 4}} \)

   (c) \( h(x) = 7^{4x^2 - 9x} \)

   (d) \( k(x) = e^{3x + 1} - e^{2x/3} \)

   (e) \( f(x) = \ln e^{8 - 9x} \)

3. Find the derivative of each function. You do not need to simplify.

   (a) \( f(x) = x^2e^x - 2\ln x + (x^2 + 1)^3 \)

   (b) \( g(x) = \ln(5x^3 - 7x^2 + 6)^4 \)

   (c) \( h(x) = \frac{\ln \sqrt{5x + 3}}{x^4} \)

   (d) \( k(x) = x^3 \ln \left(4e^{-x} - 2e^{2x}\right) \)

   (e) \( f(x) = (\ln 5x)^3 + 3x^2e^{-7x} \)

4. How long will it take $10,000 to grow to $15,000 if the investment earns an interest rate of 12% per year compounded quarterly?

5. Let \( f(t) = 350\sqrt{2t + 5} \).

   (a) Find the relative rate of change.

   (b) Evaluate the relative rate of change at \( t = 2 \).

6. A Middle Eastern oil producing country estimates that the demand for oil (in millions of barrels) is \( D(p) = 28e^{-0.04p} \), where \( p \) is the price of a barrel of oil. To raise its revenues, should it raise or lower its price from its current level of $30 per barrel?

7. If a college education costs $75,000, low large a trust fund, paying 5% compounded continuously, must be established at a child’s birth to ensure sufficient funds at age 18?

8. A $25,000 automobile depreciates by 32% per year. Find its value after 5 years.

9. True or False.

   (a) \( \ln x = \frac{1}{x} \)

   (b) \( \ln e = 0 \)
1. (a) \( \frac{2p^2}{225 - p^2} \)
   (b) revenue increases
   (c) revenue decreases
2. (a) \( f'(x) = \frac{-15x^2}{(\ln 2)(4 - 5x^3)} \)
   (b) \( g'(x) = e^{(8x^2-4)^{1/2}} \cdot \frac{1}{2}(8x^2 - 4)^{-1/2}(16x) \)
   (c) \( h'(x) = (\ln 7) \cdot 7^{4x^2-9x}(8x - 9) \)
   (d) \( k'(x) = 3e^{3x^2+1} - \frac{2}{3}e^{2x/3} \)
   (e) \( f'(x) = -\frac{9e^{8-9x}}{e^{8-9x}} = -9 \)
3. (a) \( f'(x) = x^2e^x + 2xe^x - \frac{2}{x} + 3(x^2 + 1)^2(2x) \)
   (b) \( g'(x) = \frac{4(15x^2 - 14x)}{5x^3 - 7x^2 + 6} \)
   (c) \( h'(x) = \frac{x^4 \cdot \frac{5}{2(5x + 3)} - (\ln(5x + 3)^{1/2}) (4x^3)}{x^8} \)
   (d) \( k'(x) = x^3 \left( \frac{-4e^{-x} - 4e^{2x}}{4e^{-x} - 2e^{2x}} \right) + 3x^2 \ln \left( 4e^{-x} - 2e^{2x} \right) \)
   (e) \( f'(x) = 3 \left( \ln 5x \right)^2 \cdot \left( \frac{1}{x} - 21x^2 e^{-7x} + 6xe^{-7x} \right) \)
4. time is approximately 3.43 years
5. (a) relative rate = \( \frac{2}{3(2t + 5)} \)
   (b) \( \frac{2}{27} \)
6. \( E(20) = 1.2 > 1; \) elastic, hence lower prices
7. \( P = \$30,492.72 \)
8. \( V = \$3,634.83 \)
9. (a) False; \( \frac{d}{dx} \ln x = \frac{1}{x}; \) but \( \ln x \neq \frac{1}{x} \)
   (b) False; \( \ln e = 1 \)