1. A tax schedule says a person must pay 3% of all income below the first $20,000 plus 6% of the amount exceeding $20,000. Write the piecewise definition of the tax for any income, x.

2. A rental car company charges by the day. A person pays $30 plus $0.20 per mile driven until he has driven 100 miles. Then he pays an additional $0.15 for each additional mile. Write the definition of the charge per day as a piecewise function of the number of miles driven in one day.

3. A manufacturer can sell 100 units per week of a certain product if the price per unit is $125. For each decrease of $3 in the price he can sell 10 more units. Find the demand price, p, as a function of quantity, x.

4. A company has daily fixed costs totaling $225. In addition, each unit costs $64 to produce. Demand quantity, x, and demand price, p, are linearly related. The demand quantity, x, is 50 units when the price is $90. For each decrease of $5 in the price they can sell 25 more units per day. Find the break even quantities.

5. A manufacturer has fixed costs totaling $2100 per month. Each unit costs an additional $35 to produce. The demand price is   \[ p = -0.2x + 110 \] . Find the break even quantities.

6. The amount of $10000 was invested in the year 2006 at annual interest rate, r, compounded continuously. By 2008, the accumulated amount was $10883.20.
   a) Find the interest rate as a decimal rounded to 7 decimal places.
   b) How long will it take for the accumulated amount to reach $12,500? Give the answer in years rounded to 3 decimal places.

7. \( F(x) \) is a function for which \( F(0) = 9 \) and each increase of 1 in x multiplies the function value by 3. Give a formula for \( F(x) \).

8. Solve for x in each equation.
   a) \[ \frac{1}{3} \log_2 (x + 2)^3 + \log_2 x = 3 \]
   b) \[ \log(5x + 2) - \log x = 1 \]
   c) \( x > 0 \) and \( 0.5 \ln e^3 + \ln(C^2 - x^2) = 2.5 \)
   d) \[ \frac{1}{5} \log_2 (x - 6)^5 + \log_2 x = 4 \]
   e) \[ \log(6x + 3) - \log x = 1 \]
9. \( f(x) = \begin{cases} 
4x - 1 & x < 1 \\
7 & x = 1 \\
3 + \ln x & 1 < x < 3 \\
e^{x^2 - 9} & 3 \leq x 
\end{cases} \)

Evaluate each or state DNE.

\( a) \ \lim_{x \to 1^-} f(x) \)

\( b) \ \lim_{x \to 1^+} f(x) \)

\( c) \ \lim_{x \to 3^-} f(x) \)

\( d) \ \lim_{x \to 3^+} f(x) \)

Does \( \lim_{x \to 1} f(x) \) exist? Is \( f \) continuous at \( x = 1 \)?

Does \( \lim_{x \to 3} f(x) \) exist? Is \( f \) continuous at \( x = 3 \)?

10. \( f(x) = \frac{x^2 - 2x - 3}{3x^2 - 15x + 18} \)

Evaluate each as infinity, minus infinity, or as a real number or state DNE.

\( a) \ \lim_{x \to 2} f(x) \quad b) \ \lim_{x \to 2^+} f(x) \quad c) \ \lim_{x \to -1} f(x) \)

\( d) \ \lim_{x \to 3} f(x) \quad e) \ \lim_{x \to \infty} f(x) \)
11. State the limit definition of the derivative for \( f(x) = e^x + 4x^2 \)

12. Use the limit definition of the derivative to find \( f'(x) \) for each.

   a) \( f(x) = \sqrt{x} \)  
   b) \( f(x) = x^2 \)

13. Use the results of 12 a and b for \( h(x) = 7\sqrt{x} - 9x^2 + 5 \)

14. Find an equation of the tangent line to \( h(x) = 7\sqrt{x} - 9x^2 + 5 \) at \( x = 4 \).

15. Find an equation of the tangent line to \( f(x) = \frac{1}{x} \) at \( x = 3 \).

16. Use only the power rule to find the derivative of each function.

   a) \( f(x) = x^2(x - 2) + 4x - 76 \)
   
   b) \( f(x) = \frac{x^3 - 5x^{1/3} + 12}{x} \)