INSTRUCTIONS: Calculators are allowed, but show all work. Answers without work will NOT receive full credit. Clearly indicate your final answer. Each question is worth 5 points. The maximum possible score is 60 points.

Solve the exponential equation for x.
1) $e^{-4x} = (e^7)^2 - x$

Solve the problem.
2) Find the interest earned on $12,000 invested for 4 years at 7.5% interest compounded quarterly. Round to the nearest cent.

Use the properties of logarithms to find the value of the expression.
3) Let $\log_b A = 5$ and $\log_b B = -3$. Find $\log_b \sqrt[3]{AB}$. 
Solve the logarithmic equation for x.
4) \( \log 3x = \log 5 + \log (x + 3) \)

Solve the problem.
5) Southwest Dry Cleaners believes that it will need new equipment in 6 years. The equipment will cost $26,000. What lump sum should be invested today at 5% compounded semiannually, to yield $26,000? Round to the nearest cent.

In questions #6-#8, use the properties of limits to help decide whether the limit exists. If the limit exists, find its value.
6) \( \lim_{x \to 8} (6x - 3) \)

7) \( \lim_{x \to 5} \frac{x^2 + 2x - 35}{x - 5} \)
8) \[ \lim_{x \to \infty} \frac{7x^6 - x + 6}{4x^3 - x - 8} \]

Find all values of x where the function is discontinuous.

9) \[ f(x) = \begin{cases} 
3 & \text{if } x < 6 \\
 x + 4 & \text{if } 6 \leq x \leq 9 \\
 13 & \text{if } x > 9 
\end{cases} \]

Find the average rate of change for the function over the given interval.

10) \[ y = -3x^2 - x \] between \( x = 5 \) and \( x = 6 \)
Find the equation of the secant line through the points where $x$ has the given values.

11) $f(x) = x^2 + 4x$; $x = 5, x = 2$

Use the definition of the derivative to find $f'(x)$. Then evaluate it at the given value of $x$.

12) $f(x) = x^2 - 6x - 5$; Find $f'(-4)$. 