1) If \( f(x) = 5x^2 - 3 \) and \( g(x) = 2x + 3 \), find \( g[f(x)] \).

A. \( 10x^2 \)
B. \( 20x^2 + 60x + 42 \)
C. \( 10x^2 - 3 \)
D. \( 20x^2 + 42 \)
E. \( 10x^2 + 30x + 21 \)

2) Find \( f'(x) \) or the derivative of \( f \), if \( f(x) = (4x^4 - 7x^2 + 2)^3 \). (Write answer completely factored.)

A. \( f'(x) = 6x(8x^2 - 7)(4x^4 - 7x^2 + 2)^2 \)
B. \( f'(x) = 3(16x^3 - 14x)^2 \)
C. \( f'(x) = 3x(8x^2 - 7)(4x^4 - 7x^2 + 2)^2 \)
D. \( f'(x) = 3(4x^4 - 7x^2 + 2)^2 \)
E. \( f'(x) = 6x(8x^2 - 7)(4x^4 - 7x^2 + 2) \)

3) Find the derivative of the function below. (Completely factor the derivative.)

\[ y = -4x(2x^2 - 3)^5 \]

A. \( -4(2x^2 - 3)^4(20x^2 + 2x - 3) \)
B. \( (2x^2 - 3)^4(1 - 80x^2) \)
C. \( -4(2x^2 - 3)(22x^2 - 3) \)
D. \( -4(2x^2 - 3)^4(22x^2 - 3) \)
E. \( 15360x^2(2x^2 + 3)^4 \)
4) If \( f(x) = e^{-x}(\ln x) \), find \( f'(x) \) when \( x = 1 \).

\[
\begin{align*}
A. & \quad 0 \\
B. & \quad f'(1) \text{ does not exist.} \\
C. & \quad \frac{2}{e} \\
D. & \quad e \\
E. & \quad \frac{1}{e}
\end{align*}
\]

5) Solve the equation below. Then, select the correct choice that describes the solution.

\[
32^{2x-3} = 16^{x+1}
\]

\[
\begin{align*}
A. & \quad \text{The solution is greater than 3.} \\
B. & \quad \text{The solution is less than 0.} \\
C. & \quad \text{The solution is greater than 0, but less than 1.} \\
D. & \quad \text{The solution is greater than 1, but less than 2.} \\
E. & \quad \text{The solution is greater than 2, but less than 3.}
\end{align*}
\]

6) Which statement(s) in the box below is(are) true?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>( \log_b 9 = 2 ) is equivalent to ( 3^2 = 9 ).</td>
</tr>
<tr>
<td>II</td>
<td>( \ln 21 ) is approximately 1.322.</td>
</tr>
<tr>
<td>III</td>
<td>( \log_b 50 = \log_b 5 + \log_b 10 ).</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
A. & \quad \text{I and III only.} \\
B. & \quad \text{III only.} \\
C. & \quad \text{II and III only.} \\
D. & \quad \text{I and II only.} \\
E. & \quad \text{None are true.}
\end{align*}
\]
7) Julie deposits $1500 in an account that earns a 3% interest rate compounded quarterly. If she leaves the money to grow, how much interest has the account earned in 8 years? Round to the nearest dollar. (See the formulas on the cover sheet.)

A. $92
B. $405
C. $46
D. $140
E. None of the above.

8) If \( \log_2 32 = a \), \( \log_2 3 = b \), and \( \log_2 7 = c \), find an expression to represent \( \log_2 \left( \frac{21}{32} \right) \).

A. \( bc - a \)
B. \( a - b - c \)
C. \( \frac{bc}{a} \)
D. \( b + c - a \)
E. \( -abc \)

9) Approximate the solution of this equation (rounded to 3 decimal places).

\[ 2^x = 11 \]

A. 0.289
B. 3.317
C. 3.091
D. 1.662
E. 3.459
10) Find the derivative of the function below. Factor your answer.

\[ y = \ln(x^2 + 24x) \]

A. \[ y' = \frac{x + 12}{x(x + 24)} \]
B. \[ y' = \frac{2(x + 12)}{x(x + 24)} \]
C. \[ y' = \frac{x + 12}{x + 24} \]
D. \[ y' = \frac{1}{x^2} + \frac{1}{24x} \]
E. \[ y' = \frac{1}{x(x + 24)} \]

11) Find the derivative of function \( f \) given below.

\[ f(x) = \frac{e^x}{3\ln x} \]

A. \[ f'(x) = \frac{e^x \left( \ln x^3 - \frac{1}{x^3} \right)}{9(\ln x)^2} \]
B. \[ f'(x) = \frac{e^x \left( \frac{1}{x} - 1 \right)}{3(\ln x)^2} \]
C. \[ f'(x) = \frac{e^x (\ln x - 1)}{3(\ln x)^2} \]
D. \[ f'(x) = \frac{xe^x}{3} \]
E. \[ f'(x) = \frac{e^x \left( \ln x - \frac{1}{x} \right)}{3(\ln x)^2} \]
12) Find the value of $x$ where the tangent to the graph of $y = xe^{-x}$ is horizontal.

A. 0  
B. $\frac{1}{e}$  
C. $-\frac{1}{e}$  
D. 1  
E. $-1$

13) Given: function $y = xe^x$, with first derivative $\frac{dy}{dx} = xe^x + e^x$ and second derivative $\frac{d^2y}{dx^2} = xe^x + 2e^x$.

Which of the following statements is(are) true?

<table>
<thead>
<tr>
<th>I</th>
<th>The function is increasing on the interval $(-1, \infty)$.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>The function is concave upward on the interval $(-2, \infty)$.</td>
</tr>
<tr>
<td>III</td>
<td>The function is decreasing on the interval $(-\infty, 2)$.</td>
</tr>
<tr>
<td>IV</td>
<td>There is no interval where the function is concave downward.</td>
</tr>
</tbody>
</table>

A. II and III only  
B. I and II only  
C. I only  
D. I, III, and IV only  
E. I and IV only
14) Which statement below is true about the graph of the function \( f(x) = \frac{x^2 + 4}{2 + 7x - 4x^2} \)?

A. The line \( x = 1 \) is a vertical asymptote.
B. The line \( y = \frac{1}{4} \) is a horizontal asymptote.
C. The line \( x = -\frac{1}{4} \) is a vertical asymptote.
D. The graph has no vertical or horizontal asymptotes.
E. The line \( y = 2 \) is a horizontal asymptote.

15) Find the second derivative of \( y = e^x(x-1)^2 \).

A. \( e^x(x-1)^2 \)
B. \( e^x(x^2 + 2x - 1) \)
C. \( e^x(x^2 - 2x - 1) \)
D. \( 2e^x(x-1) \)
E. \( 2e^x \)