FORMULAS  \[
\frac{d}{dx}[f(x) \cdot g(x)] = f'(x) \cdot g(x) + f(x) \cdot g'(x)
\]
\[y - y_1 = m(x - x_1)\]

\[\frac{d}{dx}[g(f(x))] = g'(f(x)) \cdot f'(x)\]
\[\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{[g(x)]^2}\]

In addition to problems of the following types, there will be one or more word problems of the types from section 3.5 and there will be word problems of the types from sections 3.4, 4.3 and 7.2.

1.) Solve each of the following:
   a.) \[3^{2xe^5} = \left(\frac{1}{9}\right)^x\]  
   b.) \[10 - e^{0.5t} = 4\]

2.) Convert \(5^{-3} = \frac{1}{125}\) to a logarithmic equation.

3.) Find the first derivatives of each of the following:
   a.) \(y = (x^2 + 1)e^{3x}\)
   b.) \(h(x) = \frac{e^x}{e^x + 1}\)
   c.) \(f(x) = \ln(x^3 + x)\)
   d.) \(g(x) = 3x^2 \ln 2x\)

4.) Find the first and second derivatives of each of the following:
   a.) \(f(t) = 3e^{-2t} - 5e^{-t}\)
   b.) \(g(x) = \ln(x^3 - 5)\)

5.) Find the intervals where each of the following is increasing or decreasing and find any relative extrema:
   a.) \(g(x) = xe^{-2x}\)
   b.) \(f(x) = \frac{\ln x}{x}\)

6.) Find the intervals of concavity and any inflection points for each of the following:
   a.) \(f(x) = 2e^{-x^2}\)
   b.) \(h(x) = x^2 \ln x\)

7.) Find the absolute extrema of \(f(x) = \frac{x}{\ln x}\) on the interval \([2, 5]\).

8.) Find the equation of the tangent line to the graph of \(g(x) = e^{-x^2}\) at the point \(\left(1, \frac{1}{e}\right)\).

9.) For each of the following, find the first partial derivatives:
   a.) \(f(x, y) = x^2y + xy^{-3}\)
   b.) \(f(x, y) = y^2e^{x^2y}\)