Assignment: Derivatives of Exponential and Logarithmic Functions

Each problem is worth 10 marks.   **/40**

Due date: Email to Mr. Elliott by Tuesday June 23rd at noon. No late assignments can be accepted.

1. Find the derivative of each of the following functions.

   a) $f(x) = 2xe^{3x-1}$ b) $y = 2^{4x+1}$ c) $f(x) = 2x^2 \ln(x^2 - 1)$

   d) $y = 2\log_3(5x + 1)$

2. a) Determine the coordinates of all point(s) on the graph of $y = 2x\ln x$ where the tangent line is perpendicular to the line $x + 4y - 7 = 0$.

   b) Find the equation of the tangent line to the graph of $f(x) = xe^x + e^x + 1$ at the point where x = 1.

3. Sketch function $f(x) = \dfrac{\ln x}{x}$ by finding all asymptotes, turning points, points of inflection and end behavior. (Find exact location of any turning points and points of inflection).

4. The population of a town can be modelled by the exponential equation $P(n) = 12000(1.02)^{n-2015}$, where P(n) is the population of the town and n is the year.

   a) According to the model, in what year will the population of the town reach 20 0000?
   b) Use the model to estimate the town's population in the year 2025.
   c) Find an approximate value for $P'(2025)$ and interpret its meaning (include units).