I.   Find the derivative. **Do not simplify** your answer.

1. $y = x^4 + x^e + x^\pi + e^x + e^\pi + \ln x + \ln 5$

2. $y = xe^{3x+5}$

3. $y = \ln\left(2x^3 + \sqrt{x}\right)$

4. $y = \dfrac{e^{4x^2+1}}{13x-8}$

5. $y = 5e^{\sqrt[3]{2x^7 - 5x + 3}}$

II.   Find the **second derivative**, $\dfrac{d^2 y}{dx^2}$. You should simplify the first derivative a bit before you differentiate again, but do not simplify the second derivative.

6. $y = \left(e^{2x} + 8\right)^7$

7. $y = \ln\left(3x + 1\right)$

III.   **Abstract Functions**.

8. Suppose $h(x) = \ln(f(x))$, and the equation of the tangent line to $f(x)$ at $x = 2$ is given by $y = 30x - 55$. Find $h'(2)$.

9. Suppose f and g are differentiable functions which have the following values

    a. Find $h'(1)$ if $h(x) = f(\ln x) + \ln(g(x))$

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	16	-9	8	14
1	5	3	7	-6

    b. Find $h'(1)$ if $h(x) = x^2 e^{f(x)}$