Directions and rules. The exam will last 60 minutes; the last five minutes of class will be used for collecting the exams. No electronic devices of any kind will be allowed, with one exception: a music player that nobody else can hear, and whose controls you do not use during the exam (just put it on shuffle). Anything (else) with an off switch must be off. In particular, turn your cell phone off.

There are eleven questions on this exam. Each one counts 9 points and you will get one free point so the total will be 100.

1. On the next page is the graph of a function \( y = f(x) \). Below that is a blank piece of graph paper. Please sketch the graph of the derivative \( y'(x) \) on that blank piece of graph paper.
2. Write the definition of the derivative

\[ \frac{d}{dx} \ln x \]

as a limit. \textit{You do not have to evaluate this limit or work on it at all, just show that you know the definition of the derivative.}

In the remaining problems, please calculate the derivative requested, showing enough steps of your calculation to demonstrate that you know the rules of differentiation. Simplify your answer if it is easy to do so, but do not make complicated simplifications.

3. 

\[ \frac{d}{dx}(x^{17} + 3x^5 - 5x^2 + x - 1) = \]

4. 

\[ \frac{d}{dx}(x^7 - 3x^2 + 1)(x^4 + x - 1) = \]
5. \[
\frac{d}{dx} \frac{x^5 - x + 1}{x^3 + 1} =
\]

6. \[
\frac{d}{dt} (t^3 - t^2 + 1)^6 =
\]

7. \[
\frac{d}{dx} \sin^3 x
\]
8. \frac{d}{dx} \tan^3(x^5)

9. \frac{d}{dx} \frac{1}{\ln(\sqrt{x})}
10. Given that $y^2 - \sin y = x$, find $\frac{dy}{dx}$ in terms of $x$ and $y$.

11. Use logarithmic differentiation to find

$$\frac{d}{dx}(x^3 + 1)^7 \sqrt{x + 1} \ln(3x) \sin(2x)$$