Calculus I, Fall 2014
Practice Exam II

October 28, 2014

Please show all work. Each problem is worth 12 points.

1. Find the derivative of $x \ln \cos x$.

2. Find the derivative of $x \ln x - x$.

3. Find the derivative of $\frac{e^x - 1}{x}$.

4. Sketch the graph of the function $f(x) = x^4 + 4x^3$, with the critical points and inflection points clearly labelled.

5. The domain of the function $f(x) = \sqrt{x - x}$ is $[0, 1]$. What is its range?

6. Find the derivative of $\frac{1-x^2}{1+x^2}$.

7. Find the derivative of $\frac{(\sin x)^{33}(x^2 + 14)^6}{(\ln x)^5}$.

8. Sketch the graph of the function $f(x) = e^x - 2x$, with the critical points and inflection points clearly labelled.

**Bonus (5 points):** Show that the curves $y = e^{-x}$ and $e^{-x} \sin x$ touch at infinitely many points, and that each of these points is an inflection point of the second curve.