Math 3a Practice Final 1.Differentiate: a) $(x^2 - 3x + 1)^{10}$ b) $x^e + \frac{e^x}{\sqrt{x}}$ c) $\sqrt[3]{x^2 + 1}$ d) $e^x \sin x$ e) x^x f) $\ln \ln x$ g) $\arctan x$ 2. Find the general anti-derivatives: a) $3x^{-1.01} + x^{-1}$ b) $\sin 3x$ c) $e^{x/3}$

3. Two cars start from the same point. One travels south at 60 mph, whereas the other travels west at 25 mph. At what rate is the distance increasing two hours later?

4. Find the equation of the tangent line to the curve $y^3 - xy^2 + y + x^2 = 7$ at the point (1,2).

5. Use calculus to sketch the curve $y = x \ln x$ (x > 0). Find all critical points, intervals of increase and decrease, local maxima and minima, inflection points, limits at 0 and at ∞ .

6. You cut a piece of wire of length 20 inches into a circle and a square. Find the minimum area that they will contain.

7. Use the formula for the derivative of $\arctan x$ to find the derivative of $\tan x$.

8. Use l'Hopital's rule to find $\lim_{x\to\infty} (1+x)^{1/x}$

Additional topics: motion diagrams, linear approximation.