

MAT227 Test 3 (Spring 2015): Log derivs, Arc Trig, L'Hopital, by Parts

Name:

Directions: Problems are not equally weighted. Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). **Good luck!**

Problem 1: (10 pts) Show all work (an anti-derivative alone is worth only one point):

a. Integrate $I = \int x \cdot \sin(x) dx$

b. Integrate $J = \int \tan(x) dx$

Problem 2: (10 pts) Do just one of the following (and circle the one you are doing):

- a. Compute the derivative of \tan^{-1} , using the fact that it's the inverse of \tan .
- b. Simplify the expression $\tan(\sin^{-1}(x - 1))$ to eliminate any trig or arc-trig functions.

Problem 3: (15 pts) Compute the following limits (no points for limits **without work**).

a. $\lim_{x \rightarrow 1} \frac{\ln(x)}{(x-1)^2}$

b. $\lim_{x \rightarrow 0} \frac{x^2}{e^x}$

c. $\lim_{x \rightarrow 0^+} \left(\frac{1}{x}\right)^x$

Problem 4: (10 pts)

- a. Consider $g(x) = \ln(x\sqrt{x^2 - 1})$. What is its domain? Compute the derivative of $g(x)$ **using properties of logs** to simplify the differentiation.

- b. Use any method (aside from a calculator!) to compute $\int \frac{r^3}{\sqrt{1+r^2}} dr$.