COLUMBIA UNIVERSITY

Math V1102
Calculus II
Spring 2014

Practice Exam I
20.02.2014

Instructor: S. Ali Altug

Name and UNI: 

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Instructions:

- There are 8 questions on this exam.
- Please write your NAME and UNI on top of EVERY page.
- In order to get full credit you need to answer the first 7 questions correctly.
- The last question is a bonus question, and you do not have to answer it.
- Unless otherwise is explicitly stated SHOW YOUR WORK in every question.
- Please write neatly, and put your final answer in a box.
- No calculators, cell phones, books, notebooks, notes or cheat sheets are allowed.
1. (3 points) \[ \int xe^x \, dx \]

2. (5 points) \[ \int x \ln(x) \, dx \]

3. (5 points) \[ \int \sec^3(x) \tan^3(x) \, dx \]

4. (5 points) \[ \int \csc(x) \, dx \]

   \textit{(Hint: You can try multiplying and diving by} \ (\csc(x) - \cot(x)).)\]

5. (6 points) \[ \int (\arcsin(x))^2 \, dx \]

   \textit{(Hint: You can try using the substitution} \ u = \sin(\theta), \ \text{and take it from there.})\]

6. (6 points) \[ \int \arcsin(x) \, dx \]

   \textit{(Hint: You can try substituting} \ x = \sin(\theta), \ \text{and then use integration by parts.})\]

7. Determine if the following improper integrals converge.

   (a) (3 points) \[ \int_0^\pi \tan(x) \, dx \]

   (b) (3 points) \[ \int_1^\infty \frac{dx}{\sqrt{x} - 1} \]

   \textit{(Hint: Think of the inequality} \ \sqrt{x} - 1 < \sqrt{x}.)\]

8. (6 points) \[ \int \frac{1}{(x^2 - 1)^{3/2}} \, dx \]

9. (6 points) \[ \int \frac{x^5 + 1}{x^4 - 1} \, dx \]

10. (3 points) Find the volume of the solid obtained by rotating the area between \( \frac{1}{x} \) and \( \frac{1}{x^2} \) from 1 to \( \infty \) around the \( x \)-axis.