Calculus II (Fall 2015)
Practice Problems for Exam 2

Note: Section divisions and instructions below are the same as they will be on the exam, so you will have a better idea of what to expect, though I will leave spaces for answers on the actual exam. However, this is not quite a mock exam as there are more practice problems here than there will be on the actual exam. Nevertheless, I recommend you treat it as a mock exam (prepare first and try to finish on your own), with a rough goal of finishing in 2–2.5 hours. Then check your solutions with those posted online, ask questions if needed, and go back and make sure you can do the problems on your own.

Instructions: Write your name and discussion section number (11–16) at the top. Read all instructions.

No notes, text, calculators, etc. are allowed. Please answer the questions in the space provided below. You may use the back of the pages as scratch paper. If you run out of space for your answer on the front, you may continue it on the back provided you note that your answer continues on the back. Each section has additional instructions below. Maximum score: $\ln 1$ points.

1   Tantalizingly True or Foolishly False

Instructions: Circle T or F for each question. No work is needed. Each problem is worth $\lim_{t \to \infty} e^{-t}$ points.

1. T   F   Let $f : A \to B$ be one-to-one. Then $f^{-1} : B \to A$ exists.

2. T   F   When defined, $f^{-1}(x) = f(x)^{-1}$.

3. T   F $\lim_{t \to 1} \ln t = 0$.

4. T   F $\ln(5e) = 1 + \ln 5$.

5. T   F   The image of $\sin^{-1} x$ is all real numbers.

6. T   F $\cos(\tan^{-1} x) = \sqrt{1 + x^2}$.

7. T   F $\int \frac{dx}{x} = \ln x + C$

8. T   F $\int_0^\infty \frac{1}{x^2} dx$ converges.

2   Enlightening Exercises

Instructions: For each problem below, **show your work**. **For calculations, box in your final answer**. Each problem is worth $\int_{-1}^1 xe^{-x^2} dx$ points.

9. Compute $\lim_{x \to 0^+} x \ln x$.

10. Using the formula for $\frac{d}{dx} e^x$, prove $\frac{d}{dx} a^x = a^x \ln a$ (for $a > 0$).

11. Using integrals, prove a formula for the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (for $a, b > 0$).

12. Compute $\int \frac{1}{\sqrt{x^2 - 9}} dx$.

13. Compute $\int \frac{x}{\sqrt{x^2 - 9}} dx$.

14. Compute $\int \frac{x^3 + 1}{x^2 + 1} dx$.

15. Evaluate $\int \frac{1}{x^3+x} dx$.

16. Compute $\int \cos^3 x \, dx$.

17. Evaluate $\int x^2 \sin^2 x \, dx$.

18. Evaluate $\int \ln x \, dx$.

19. Evaluate $\int \frac{dx}{e^x+1}$.

20. Evaluate $\int e^x \sin x \, dx$.