Math 30: Unit 1 Exam

Fall Semester 2006

Instructions. Read each problem carefully and follow all of its instructions. For each of the problems below, write a clear and concise solution in your blue book. For any short answer questions, write clearly your answer and any additional explanation that is needed.

1. (5 points) Explain why you must add a constant when computing an indefinite integral, but not when computing a definite integral.

2. (5 points) Evaluate exactly the integral $\int_1^2 \frac{x^2+1}{x} \mathrm{d}x$.

3. (5 points) Use the method of substitution to find $\int z \sin(z^2+1) \mathrm{d}z$

4. (5 points) Find the exact value of $\int_0^1 4te^{2t} \mathrm{d}t$.

5. (5 points) According to a book of mathematical tables,

$$\int \frac{1}{1+u^2} \mathrm{d}u = \arctan(u) + C.$$

Use this formula and substitution with $u = e^x$ to find

$$\int \frac{e^x}{1+e^{2x}} \mathrm{d}x.$$