Midterm 1 – Math 2300 – September 18, 2013

On my honor as a University of Colorado at Boulder student I have neither given nor received unauthorized assistance on this exam.

Name:_____

Please select your section:

$\bigcirc 001$	M. GRIMES
002	A. Spina
003	A. Spina(11 Am)
004	C. Mesa
005	F.T. LIU
006	C. Bridges(3 PM)
007	К. Smith(8 ам)
008	S. Henry

In order to receive full credit your answer must be **complete**, **legible** and **correct**. You should show all of your work, and give clear explanations. **Calculators**, **phones or other electronic devices are not allowed**.

Question	Points	Score
1	12	
2	12	
3	8	
4	10	
5	12	
6	12	
7	12	
8	10	
9	12	
Total:	100	

1. (12 points) The rainfall rate last Thursday from 4:00 pm to 10:00 pm can be modeled as

 $r(t) = 2te^{t^2/6}$

where t represents time in hours since 4:00 and r(t) is measured in inches per hour. Integrate r(t) over the appropriate interval to determine how many inches of rain fell between 4:00 pm and 10:00 pm last Thursday.

2. (12 points) $\int_0^1 \arctan x dx =$

3. (a) (4 points) For the integral $\int_1^3 \frac{1}{x} dx$, calculate the following:

LEFT(2) =
RIGHT(2) =
MID(2) =
TRAP(2) =
(b) (4 points) For each of the following, state whether it is an overestimate or underestimate of the integral. Give a reason why.

LEFT(2)	the integral because	

MID(2) _____ the integral because _____.

4. (10 points) If $\int_0^6 f(x) \, dx = 12$, then find $\int_0^2 f(3s) \, ds$.

5. (12 points) $\int \frac{1}{x(x^2+4)} dx =$

6. (a) (6 points) Perform the appropriate trig substitution on the integral $\int x\sqrt{x^2+16} \, dx$.

(b) (6 points) Complete the calculation of the integral by evaluating the resulting trig integral from the previous part.

7. (12 points) Evaluate $\int_0^2 \frac{1}{x-1} dx$.

8. (10 points) Evaluate $\int_0^2 x f''(x) dx$ if f(0) = 1, f(2) = 4, and $f'(0) = e, f'(2) = \pi$, and f''(0) = 9, f''(2) = 16.

9. For each of the following improper integrals, determine convergence or divergence by comparing to another integral. For each problem, make sure to:

i) write down an inequality showing the relationship between the given function and your comparison function,ii) state whether the improper integral of your comparison function converges or diverges, and

iii) state whether the given improper integral converges or diverges.

(a) (6 points)
$$\int_1^\infty \frac{dx}{\sqrt{x}(x+1)} dx$$
.
i)

ii)

iii)

(b) (6 points) $\int_1^\infty \frac{(\ln x)^2}{x} dx.$ i)

ii)

iii)