Math 2300, Midterm 1

September 25, 2017

PRINT YOUR NAME: _____

PRINT INSTRUCTOR'S NAME: _____

Mark your section/instructor:

☐	Section 001	Brendt Gerics	8:00–8:50
☐	Section 002	Tyler Schrock	8:00–8:50
☐	Section 003	Xingzhou Yang	9:00–9:50
☐	Section 004	Al Bronstein	9:00–9:50
☐	Section 006	Sebastian Bozlee	10:00–10:50
☐	Section 007	Athena Sparks	11:00–11:50
☐	Section 008	Trevor Jack	4:00–4:50
☐	Section 009	Jun Hong	12:00–12:50
☐	Section 011	Isabel Corona	1:00–1:50
☐	Section 012	Hanson Smith	2:00–2:50
☐	Section 013	Noah Williams	3:00–3:50
☐	Section 014	John Willis	3:00–3:50
☐	Section 015	Robert Hines	4:00–4:50
☐	Section 016	Sarah Salmon	4:00–4:50
☐	Section 017	Xingzhou Yang	8:00–8:50
☐	Section 880	Trubee Davison	9:00–9:50

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	6	
6	6	
7	10	
8	10	
9	14	
10	8	
11	6	
Total:	100	

- No calculators or cell phones or other electronic devices allowed at any time.
- Show all your reasoning and work for full credit, except where otherwise indicated. Use full mathematical or English sentences.
- You have 90 minutes and the exam is 100 points.
- You do not need to simplify numerical expressions unless otherwise stated. For example leave fractions like $100/7$ or expressions like $\ln(3)/2$ as is.
- When done, give your exam to your instructor, who will mark your name off on a photo roster.
- We hope you show us your best work!

1. (10 points) Evaluate the following indefinite integral.

$$\int xe^{-x}\,dx$$

2. (10 points) Evaluate the following indefinite integral.

$$\int e^x \cos(x)\, dx$$

3. (10 points) Evaluate the following indefinite integral.

$$\int (\tan(x))^4 \cdot (\sec(x))^4 \, dx$$

4. (10 points) Evaluate the following indefinite integral.

$$\int \frac{16}{(x^2-4)(x-2)}\,dx$$

5. (6 points) Which of the following integrals arises when one makes a suitable trigonometric substitution to compute? Circle your answer.

$$\int \frac{x^2}{\sqrt{4-x^2}}\,dx$$

A) $\displaystyle\int 4\left(\sin(\theta)\right)^2\,d\theta$ B) $\displaystyle\int \frac{2\left(\sin(\theta)\right)^2}{\cos(\theta)}\,d\theta$ C) $\displaystyle\int \frac{\left(\tan(\theta)\right)^2\cdot\sec(\theta)}{4}\,d\theta$

D) $\displaystyle\int \frac{\left(\tan(\theta)\right)^2}{4\sec(\theta)}\,d\theta$ E) $\displaystyle\int \frac{2\left(\cos(\theta)\right)^2}{\sin(\theta)}\,d\theta$ F) $\displaystyle\int -4\left(\cos(\theta)\right)^2\,d\theta$

6. (6 points) Find the average value of $f(x) = 3x^2 + 2x + 1$ on the interval $[-1, 3]$. Circle *the* correct answer.

A) 8 B) 10 C) $\frac{21}{2}$ D) 20 E) 40

7. (10 points) For the following improper integral, determine whether it is convergent or divergent. If the integral is convergent, compute its precise value.

$$\int_3^5 \frac{1}{\sqrt{5-x}}\, dx$$

8. (10 points) For the following improper integral, determine whether it is convergent or divergent. If the integral is convergent, you do NOT have to compute its precise value.

$$\int_1^{\infty} \frac{2 + \ln(t+1)}{t} \, dt$$

9. Consider the region A bounded by $y = (x-1)(x-3)^2$ and the x-axis between $x = 1$ and $x = 3$.

   (a) (7 points) Set up an integral which uses the **cylindrical shell method** to compute the volume of the solid obtained by rotating A about the y-axis. Do NOT evaluate the integral.

   (b) (7 points) Set up an integral which uses the **disk/washer method** to compute the volume of the solid obtained by rotating A about the line $y = -1$. Do NOT evaluate the integral.

10. (8 points) Let R be a solid with base enclosed by the parabola $y = 1 - x^2$ and the x-axis. Set up an integral to find the volume of R if the cross-sections perpendicular to the **y-axis** are **squares**. Do NOT evaluate the integral.

11. (6 points) Circle the integral which represents the arc length of the function given by the equation $f(x) = \frac{1}{2}x^2$ from $x = 0$ to $x = 1$

A) $\int_0^1 \sqrt{1+x}\,dx$ B) $\frac{1}{2}\int_0^1 \sqrt{1+x}\,dx$ C) $\int_0^1 \sqrt{1+x^2}\,dx$

D) $\frac{1}{2}\int_0^1 \sqrt{1+x^2}\,dx$ E) $\int_0^1 \sqrt{1+2x+x^2}\,dx$ F) $\frac{1}{2}\int_0^1 \sqrt{1+2x+x^2}\,dx$

G) $\int_0^1 \sqrt{1+\frac{x^4}{4}}\,dx$ H) $\frac{1}{2}\int_0^1 \sqrt{1+\frac{x^4}{4}}\,dx$