Midterm Exam #2 for Math 104-004, Fall 2016

Name (printed): _____ Recitation hours: _____

My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this midterm examination.

Signature: _____ Date: _____

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- Box your final answers.
- You have 50 minutes for this exam.
- Please show **ALL** your work on this exam paper. Partial credit will be awarded where appropriate. Answers with little or no justification will get no credit.
- You may use both sides of one 8.5 by 11 inch sheet of notes.
- **NO** books, laptops, cell phones, calculators, or any other electronic devices may be used during the exam.
- No form of cheating will be tolerated. You are expected to uphold the Code of Academic Integrity.

1. (10 points) Compute the following integral

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

2. (a) (2 points) Perform the following long division: $x + 2 \overline{)x^3 + 8}$.

(b) (8 points) Using partial fractions, evaluate the following integral:

$$\int_1^2 \frac{x}{x^3 + 8} dx.$$

(Hint: Use part (a))

3. A tire company produces tires for sedans. Suppose the lifetime in miles of a tire is described by a continuous random variable L. Let $f(L)$ be the probability density for the random variable L. Answer the following questions:

   (a) (2.5 points) What is the meaning of the integral $\int_{10,000}^{20,000} f(L)dL$?

      i. The integral is the probability that the tire will fail at 15,000 miles.

      ii. The integral is the probability that the tire will fail at either 20,000 miles or 10,000 miles.

      iii. The integral is the probability that the tire will fail at some point between 10,000 miles and 20,000 miles.

   (b) (2.5 points) What is the meaning of the integral $\int_{-\infty}^{20,000} f(L)dL$?

      i. The integral is the probability that the tire will fail before 20,000 miles.

      ii. The integral is the probability that the tire will fail exactly at 20,000 miles.

      iii. The integral is the probability that the tire will fail after 20,000 miles.

   (c) (2.5 points) What is the meaning of the integral $\int_{10,000}^{\infty} f(L)dL$?

      i. The integral is the probability that the tire will never fail.

      ii. The integral is the probability that the tire will fail before 10,000 miles.

      iii. The integral is the probability that the tire will fail after 10,000 miles.

   (d) (2.5 points) What is the meaning of the integral $\int_{0}^{15,000} f(L)dL$?

      i. The integral is the probability that the tire will fail at 0 miles.

      ii. The integral is the probability that the tire will fail at 15,000 miles.

      iii. The integral is the probability that the tire will fail at some point before 15,000 miles.

4. Evaluate the following integral:

$$\int e^x \sin(x) \cos(x) dx.$$

5. (10 points) Determine whether the following integral is convergent or divergent:

$$\int_0^\infty \frac{5+\cos\left(e^x\right)}{x^2+1}dx.$$

Justify your answer completely. More specifically, state whether you will be using the direct comparison test or the limit comparison test; And state precisely why the hypotheses of that test are satisfied.

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