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Print First and Last Name legibly

Math 1300 Final Exam Fall 2022

Show all work on the given paper. A correct answer with little or no supporting work will receive little or no credit. Show work that will convince me that you know how to do each problem.

There are 10 questions, each worth 10 points.

You have 120 minutes to complete the exam. After you have finished the exam, please sign the academic integrity statement below:

Academic Dishonesty Definitions

Activities that have the effect or intention of interfering with education, pursuit of knowledge, or fair evaluation of a student's performance are prohibited. Examples of such activities include but are not limited to the following definitions:

- A. **Cheating:** using or attempting to use unauthorized assistance, material, or study aids in examinations or other academic work or preventing, or attempting to prevent, another from using authorized assistance, material, or study aids. *Example:* using a calculator in a quiz or exam, altering a graded exam, and resubmitting it for a better grade, etc.
- B. **Plagiarism:** using the ideas, data, or language of another without specific or proper acknowledgment. *Example:* copying another person's paper, article, or computer work and submitting it for an assignment, cloning someone else's ideas without attribution, failing to use quotation marks where appropriate, etc.
- C. **Fabrication:** submitting contrived or altered information in any academic exercise. *Example:* making up data for an experiment, fudging data, citing nonexistent articles, contriving sources, etc.
- D. **Multiple submission:** submitting, without prior permission, any work submitted to fulfill another academic requirement.
- E. **Misrepresentation of academic records:** misrepresenting or tampering with or attempting to tamper with any portion of a student's transcripts or academic record, either before or after coming to the University of Pennsylvania. *Example:* forging a change of grade slip, tampering with computer records, falsifying academic information on one's resume, etc.
- F. **Facilitating academic dishonesty:** knowingly helping or attempting to help another violate any provision of the Code. *Example:* working together on a take-home exam, etc.
- G. **Unfair advantage:** attempting to gain unauthorized advantage over fellow students in an academic exercise. *Example:* gaining or providing unauthorized access to examination materials, obstructing or interfering with another student's efforts in an academic exercise, lying about a need for an extension for an exam or paper, continuing to write even when time is up during an exam, destroying or keeping library materials for one's own use, etc.

If a student is unsure whether his action(s) constitute a violation of the Code of Academic Integrity, then it is that student's responsibility to consult with the instructor to clarify any ambiguities.

I have read the above definitions and my signature below indicates that I have not violated Penn's Code of Academic Integrity.

Signature

You are
**AWESOME
& AMAZING**

Your life is full of
POSSIBILITIES

YOU GOT THIS!

You can do
ANYTHING
You believe
YOU CAN

You call the shots!

**YOU HAVE
WHAT IT
TAKES**

*JOY
PEACE
FUN*

You are
LOVED

♥ **GOOD
THINGS**
are coming

**YOU ARE
DESTINED
TO BE A
GREAT
SUCCESS**

**EVERYTHING IS ALWAYS
WORKING OUT FOR YOU**

♥ **Today is your day!** ♥

1. Evaluate the limits

$$a) \lim_{x \rightarrow -1} \frac{8\sqrt{x+5} - 16}{x+1}$$

$$b) \lim_{h \rightarrow 0} \frac{\sin(x+h) \cos(x+h) - \sin x \cos x}{h}$$

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2. Evaluate the limit below

$$\lim_{x \rightarrow 0} \frac{1 - \cos(4x)}{(x + 1) \ln(x + 1) - x}$$

3. Tell whether the following statements are True or False. If true, then prove that the statement is true. If false, then provide a counterexample.

a) If $f(x)$ is an even function, then $f'(x)$ is an odd function.

b) The equation $\sqrt[3]{x} + x = 1$ has a solution on the interval $(0,1)$.

4. a) Let

$$f(x) = e^{\cos x} - \ln(5x + 11) + \sec(3x) - \arctan(x^2) + \sinh(\sqrt{x})$$

Find $f'(x)$.

b) Evaluate the following

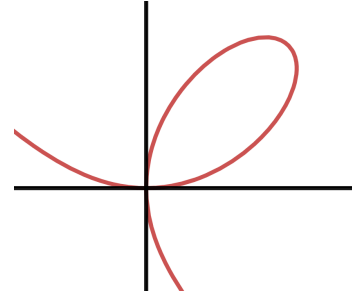
$$\int \left(\frac{1}{e^x} + 4\sqrt{x} - \csc^2 x + \frac{12}{x^7} + \pi \right) dx$$

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5. Consider a cube of variable size. (The edge length is increasing.) Assume that the volume of the cube is increasing at the rate of $10 \text{ cm}^3/\text{minute}$. How fast is the surface area increasing when the edge length is 8 cm ?

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6. Find $x > 0$ such that the curve $x^3 + y^3 = 6xy$ has a horizontal tangent line.



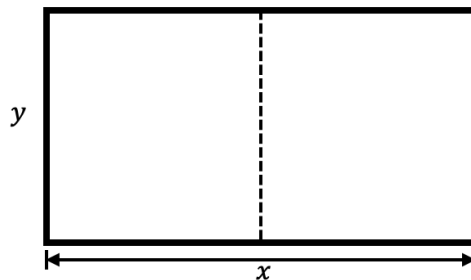
7. Let

$$f(x) = \frac{10x}{x^2 + 1}$$

Find the absolute maximum value and absolute minimum value of $f(x)$ on the interval $[-3, 2]$.

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8. Alex wants to build a rectangular wooden fence to enclose an area of 80 square feet. Inside, there is a partition made of wire mesh. The wooden fencing costs \$2 per foot and the wire mesh costs \$1 per foot. Find the dimensions of the fence that minimizes the cost. Make sure that you verify that this is a minimum.



9.

a) Find the value of a so that the function below is continuous on the interval $-1 \leq x \leq 9$.

$$f(x) = \begin{cases} |x - 3|, & -1 \leq x < 5 \\ ax - \frac{1}{2}, & 5 \leq x \leq 9 \end{cases}$$

b) Using the function from part a, evaluate the integral below

$$\int_{-1}^9 f(x) dx$$

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10. Evaluate the integral

$$\int_1^4 \frac{36}{\sqrt{x}(1 + \sqrt{x})^3} dx$$

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