

Math 20A: Calculus for Science and Engineering I

Midterm Exam 2

Winter 2022

- You will have **50 minutes** to complete this exam.
- Please have your student ID easily accessible to show to a proctor when asked.
- You may use one 8.5 x 11 inch sheet of handwritten notes, but no calculators, phones, or other study aids.
- Simplify all answers, unless specified otherwise. (**Note: it is okay for your answers to contain fractions in lowest terms, as well as numbers like e and π and $\sqrt{2}$.**)
- Please show your work and explain your answers for each problem unless otherwise specified—we will not award full credit for the correct numerical answer without proper explanation.
- Please write your final answer for each problem in the indicated area. If you do any work on the backs of the pages or on additional scratch paper that you would like to have graded, **please indicate that clearly; otherwise it will not be graded.**
- Don't forget to write your name on the top of every page.
- Good luck!

Name: _____

PID: _____

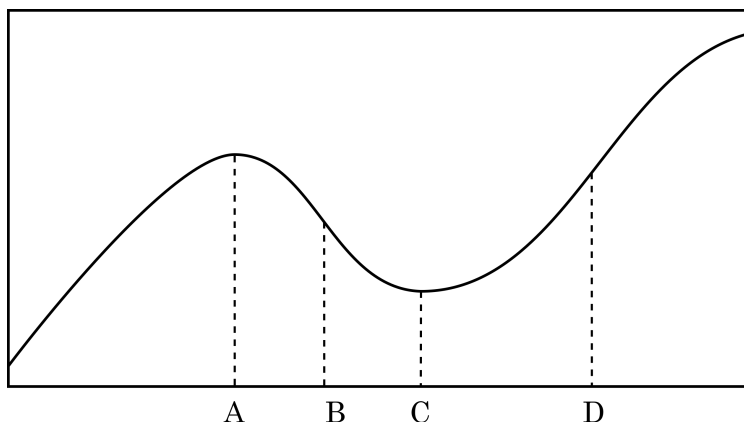
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Problem 1: (8 points) For each curve property below, identify all the labeled points on the graph having that property.

(You do not need to show your work or justify your answers for this problem.)

| Property | Point(s) |
|-----------|----------|
| $f' = 0$ | |
| $f'' = 0$ | |
| $f'' < 0$ | |
| $f'' > 0$ | |



Problem 2: (4 points) Calculate the following derivative: $\frac{d}{dx} (e^{x^4-x})$.

(You do not need to show your work or justify your answers for this problem.)

Choose one:

- $\frac{4x^3 - 1}{x^4 - x}$
- $(x^4 - x) \cdot e^{x^4-x-1}$
- $(4x^3 - 1) \cdot e^{x^4-x}$
- e^{x^4-x}

Problem 3: (4 points) For the function $f(x) = x^2 2^x$, there is at least one value c in $(0, 1)$ such that:

(You do not need to show your work or justify your answers for this problem.)

Choose one:

- $f'(c) = -2$
- $f'(c) = 0$
- $f'(c) = 2$
- $f'(c)$ DNE
- Not enough information.

Name: _____

Problem 4: (10 points) Compute the following limit: $\lim_{x \rightarrow \infty} \frac{\ln(x)}{x}$.

Answer:

Name: _____

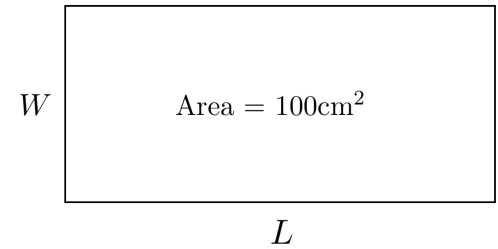
Problem 5: (12 points) Find the linearization of $f(x) = \sin(x)$ at $x = 0$, and then use it to approximate $\sin(.001)$ (*all angles are taken in radians*).

Linearization:

Approximation of $\sin(.001)$:

Name: _____

Problem 6: (12 points) A rectangle has a constant area of 100 cm^2 , and its width W is decreasing at a constant rate of 0.5 cm/sec . At the moment when its width is 5 cm , how quickly is its length L increasing?



Answer:

Name: _____

Problem 7: (3 points) *Bonus problem* – I recommend focusing on the other problems and trying this one only if you have extra time!

Find a point at which the curve $x^2 + y^2 = 2xy + 2y$ has a horizontal tangent line.

Answer: