

## Math 120 A Winter 2025 Midterm II

February 25, 2025

Name\_\_\_\_\_

Student Number\_\_\_\_\_

### Instructions

- These exams will be scanned. **Please write your name and student number clearly.**
- There are 4 questions. The exam is out of 50 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. No printed material allowed. **Hand in your notes with your exam.**
- You can only use a Ti-30x IIS calculator. Unless otherwise stated, you have to give exact answers to questions. ( $\frac{2}{\pi}$  and  $1/3$  are exact, 0.6366 and 0.333 are approximations for those numbers.)
- Show your work. If we cannot read or follow your work, we cannot grade it. **You may not get full credit for a right answer if your answer is not justified by your work.**

1. (10 points) You have a piece of wire which is 120 centimeters long. You will break it into two. The first piece will become a rectangle, whose length is twice its width  $w$ . The second one will become an equilateral triangle. What are the dimensions of the triangle and the rectangle which would result in a minimum area?

Give your answers in exact simplified form. If you cannot, round your answers to two places after the decimal.

*Hint: The area of an equilateral triangle with one side  $x$  is  $\frac{\sqrt{3}}{4}x^2$ .*

2. (13 points) A bacteria colony triples its population every 90 minutes and there are currently 7500 bacteria in the colony. You can model the population of the bacteria by an exponential function.
- (a) What will the population be 3 hours from now? Round your answer to the nearest bacteria.
- (b) What is the percentage change in the population over a one-hour period? Round to one digit after the decimal.
- (c) How long does it take for the population to double? Give your answer in minutes and round to the nearest minute.

3. (14 points) Write down the letter of the graph next to its polynomial equation:

-----  $y = (x - 3)^6 + 2$

-----  $y = (x - 3)^2 + 2$

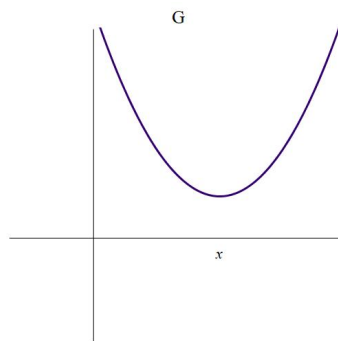
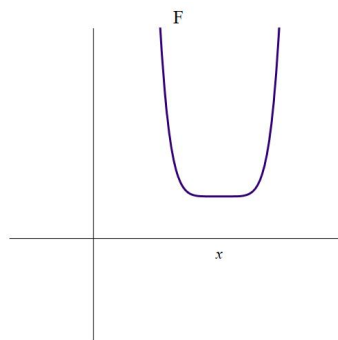
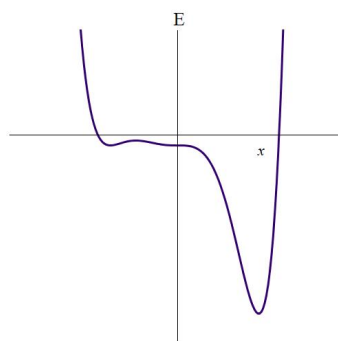
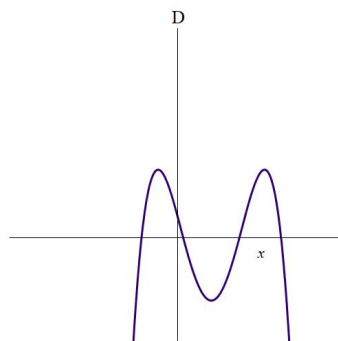
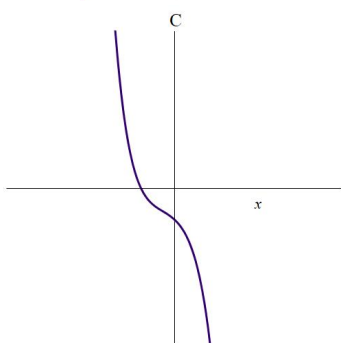
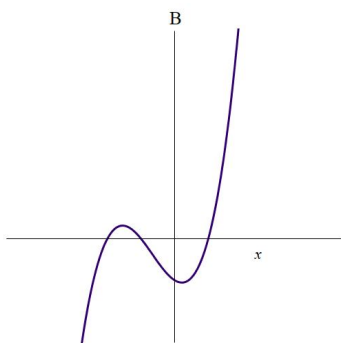
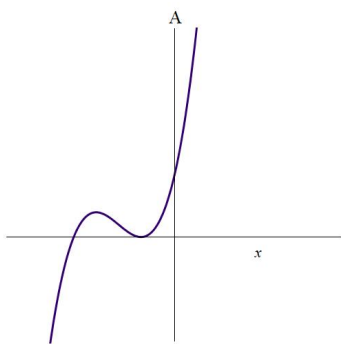
-----  $y = (x + 3)(x + 1)^2$

-----  $y = x^6 + x^5 - 8x^4 - 12x^3 - 1$

-----  $y = (x + 2)(x + 1)(x - 1)$

-----  $y = -x^4 + 4x^3 - x^2 - 6x + 1$

-----  $y = -x^5 - x^4 - 4x^3 - 4x^2 - 4x - 4$



4. (13 points) (a) Solve for  $x$  in  $\ln(x+1) - \ln(x) = 4$ .

(b) If  $f(x) = \sqrt{3x+4}$  and  $g(x) = \frac{1}{x-4}$ , what is the formula for  $g^{-1}(f(x))$  and what is its domain?

*This page is empty. You can use it for scratch work. If you continue a question here and want it graded, make a note on the question page so we will look.*