

Final Exam

Calculus 1

Spring 2017

Name (last name first): \_\_\_\_\_ Instructor: \_\_\_\_\_

**SHOW ALL YOUR WORK! JUSTIFY YOUR ANSWER!****NO PARTIAL CREDIT WILL BE GIVEN FOR THE ANSWER ONLY!**

If you have time, find a way to check your answers.

Part 1
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**You must simplify your answer but don't simplify numbers!**1. [6 points] Use the **DEFINITION** of the derivative to find  $(x^2 + 3x)'$ .2. [6 points] Find the derivative of  $f(x) = e^x \ln x$ .3. [6 points] Find the derivative of  $f(x) = \sin(x^4)$ .

4. [6 points] Differentiate  $f(x) = \frac{x^2}{x^3 + 6}$ .

5. [6 points] Find the derivative of  $F(x) = \int_0^x t^3 e^t \ln t dt$ .

6. [6 points] Evaluate  $\int x^3(x + 4)dx$ .

7. [6 points] Evaluate  $\int \frac{x^3 + x + 1}{x^4} dx$

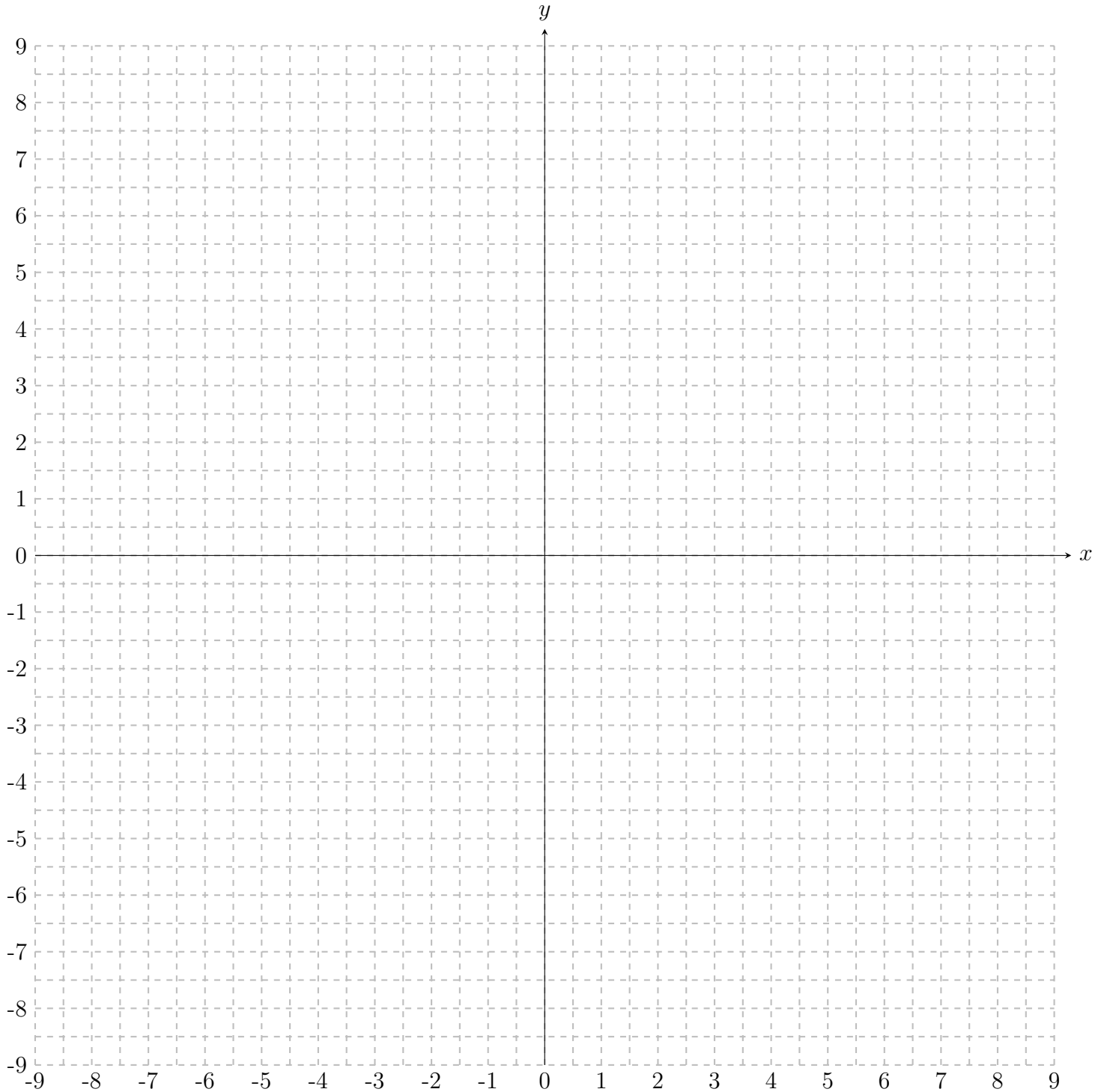
8. [6 points] Evaluate  $\int e^x \cos(e^x) dx$ .
9. [6 points] Use a Riemann sum with 3 terms and the midpoint rule to approximate the value of  $\int_0^3 \cos(x^3) dx$ . [You do not need to add the resulting sum of numbers; i.e., an expression like  $\ln(17) + e^3 + 2$  could be a complete answer!]
10. [6 points] Use Newton's method to find the second approximation to the solution of the equation  $x^3 + x + 1.9 = 0$  if the first approximation is  $x_1 = -1$ .



3. [10 points] A farmer wants to fence a rectangular piece of land along the side of a river. The side of the plot facing the river should not be fenced. The bank of the river is straight. The material used for the left and the right sides of the plot is \$25 per yard. The material used for the side of the plot parallel to the bank of the river is \$32 per yard. Finally, the area of the plot must be equal to 100 square yards. Find the dimensions of the plot minimizing the price of the fencing material. **USE CALCULUS TO SOLVE THE PROBLEM! SHOW ALL YOUR WORK! YOU MUST JUSTIFY YOUR ANSWER!**

4. [10 points] **USE CALCULUS** to graph the function  $\frac{x^2-4}{x+1}$ . Indicate  $x$  and  $y$  intercepts, horizontal and vertical asymptotes (if any). Find intervals where the function is increasing or decreasing. Mark any local/absolute maxima/minima of the graph.

You can use decimal numbers and your calculator to compute approximate values. Use the coordinate system below to draw your graph. **YOU MUST JUSTIFY YOUR WORK!**



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