Name (Print last name first): ..........................................

Show all your work and justify your answer!
No partial credit will be given for the answer only!

PART I

You must simplify your answer when possible.
All problems in Part I are 8 points each.

1. If \( f(x) = x^2 e^{3x} \), find the derivative \( f'(x) \).

2. Find the derivative of \( f(x) = \ln(x^2 + 2) \).
3. Evaluate $\int e^{6x+1} \, dx$

4. Evaluate $\int \frac{1}{x \ln(x)} \, dx$
5. Solve $e^{2x-5} = 10$.

6. Solve $\ln(4x + 3) = 2$. 
7. Use Newton’s method to approximate the solution of the equation \( \sin(x) - 0.55 = 0 \) near \( \pi/6 \). Hint: choose \( x_1 = \pi/6 \) and find \( x_2 \). Give only the expression for \( x_2 \) and not its decimal value.

8. Given \( f(x) = x^7 + x^5 + 2 \) show first that \( f(x) \) is one-to-one and then compute \( f^{-1}(2) \).
1. [10 points] Evaluate \( \int_{1}^{2} \frac{\ln x}{x} \, dx \). Show your work and do NOT give a decimal number as your answer (i.e., give an expression involving an appropriate function as your answer).
2. [12 points] Given the graph of $y = f(x)$ below read off the graph the following:

1. the value of $y = f(4)$
2. the value of $x = f^{-1}(0)$
3. Estimate the derivative $f'(1)$. (Hint: draw the tangent line and estimate its slope).
4. Estimate the derivative of $(f^{-1})'$ at 0. (Hint: draw the tangent line and estimate its slope). Indicate in the graph how you found your values!
3. [14 points]
Find absolute minimum and absolute maximum of the function \( f(x) = e^x(2 - x) \) on the interval \([2, 3]\).
Scratch paper