

Instructions:

- For all problems, you must show work in the exam booklet.
- You must display your student ID while taking your exam and when submitting your exam.
- When finished, you must sign both the exam sheet and the exam booklet.
- When finished, you must insert the exam sheet inside the exam booklet.
- Print your name, your TA's name and your discussion time on the exam booklet.
- Do not write in the upper right corner of the exam booklet. This is for recording scores.

1. (a) Write the general forms of the Power Rule, Exponential Rule and Log Rule for derivatives.
(b) Write the general forms of the Power Rule, Exponential Rule and Log Rule for integrals.

Use the rules above to determine the following integrals. **Do not use the substitution method.**

2. $\int 8x^2(3 + 10x^2)(2x^3 + 4x^5)^6 dx$
3. $\int \frac{2x^2(3 + 10x^2)}{(2x^3 + 4x^5)} dx$
4. $\int (6x^2 + 20x^4)e^{(2x^3+4x^5)} dx$
5. Find the area between $f(x) = \frac{1}{x}$ and the x-axis for x between $x = 1$ and $x = 4$. Show your work including your graph, differential area and limits. Give your answer to 4 decimal places.
6. Use logarithmic differentiation to find $f'(x)$ at $x = 1$ if $f(x) = (3x + 1)^x$. Give your answer to 4 decimal places.
7. Solve the following equation for x . Give your answer to 4 decimal places. Show your work.
$$\ln(5e^{2x}) + \ln(4e^{4x}) + \ln(1) \cdot (3x^5 + 4x^2 + 999) = \ln(100)$$
8. (a) How many years will it take **\$200** to grow to **\$4,000** if compounded quarterly and invested at **10%** per year?
(b) Repeat if compounded continuously. Give your answers to 4 decimal places.