

Problem	Points	Score
1	8	
2	10	
3	8	
4	24	
Total	50	

Instructions:

1. Do all of your work in this booklet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**.
5. If you need more space, you may **use the back of the page** and write **On back Page #** in the problem space.

1. Definitions (6 pts)

a. Give the Product Rule for Differentiation.

b. Give the Integration by Parts Formula.

c. State the Fundamental Theorem of Calculus

d. Define improper integral.

2. Differentiation (10 pts)

a. Differentiate $f(t) = t^{-1} - 2\sqrt{t}$.

b. Differentiate $y = \ln(5x+3)$.

c. Find the location and values of all relative minima and maxima for $f(x) = 2x^3 + 3x^2 - 12x + 5$.

3. Problems (8 pts)

a. Find the average of $f(x) = \sqrt{x+1}$ from $x = 0$ to $x = 8$.

b. Let $f(x) = \frac{1}{2}x$ for $x = 0$ to $x = 2$.

i. Describe the surface of revolution of this function about the x -axis.

ii. What is the volume?

4. Integration (24 pts) Compute the following integrals using whatever methods and rules we know.

a. $\int_1^2 \frac{5}{x^4} dx.$

b. $\int 2xe^{3x^2} dx.$

c. $\int \frac{x}{\sqrt{25+9x^2}} dx.$

d. $\int_0^1 x^2 e^{x/2} dx.$

e. $\int \ln 2x dx.$

f. $\int_1^{\infty} x^{-1} dx.$ (Does this integral converge or diverge?)

g. $\int_1^{\infty} 6e^{-x} dx.$ (Does this integral converge or diverge?)

h. Find the area between the x-axis and $f(x) = (x+2)^6$ over $[-2,0]$.