MATH 152 **Name:** .
Class time:

Show all work. Part A. Problems 1-4, 6 points each.

1. Use integration by parts to evaluate $\int \ln(x)\,dx$

2. What is the average value of the function $f(x) = x^2$ on the interval $[-2, 2]$?

3 Does $\int_1^\infty \frac{x}{x+1}\,dx$ converge or diverge and why? Hint: you don't have to perform the integration to find the answer.

4. If $f(x, y) = xe^{xy}$ find $f_x(1, 1)$.

Part B 5-9 12 Points each

5. Use integration by parts to evaluate $\int_0^1 x^2 e^{-x}\,dx$. You may leave your answer at the evaluation bar.

6. Show the volume of a sphere of radius r is $\frac{4}{3}\pi r^3$ by finding the volume of the function $y = \sqrt{r^2 - x^2}$ from $-r$ to r rotated around the x-axis.

7. Let $f(x, y) = 7x^2 - 2y^4$ compute $\frac{f(x+h, y) - f(x, y)}{h}$. What is $\lim_{h \to 0} \frac{f(x+h, y) - f(x, y)}{h}$

8. If $p > 1$ find the value of $\int_1^\infty \frac{1}{x^p}\,dx$ in terms of the variable p.

9. A car dealership estimates that the total weekly sales of a car is a function of the car's price, p, and the interest rate in percent,i, (here 8% implies $i = 8$) offered by the manufacturer. The approximate weekly sales are given by $S(p, i) = 132p - 2pi - .01p^2$.

a) Find an interpret $S_i(p, i)$.

b) What would be the effect on weekly sales if the price is \$9400 and the interest rate rises from 8% to 9%?

10. (16 pts) Show that the point $(-1, -\frac{1}{2})$ is a critical point for the function $f(x, y) = x^2 - 2xy + 2y^2 + x - 5$ and determine if it is Relative Max or Relative Min. Be sure to include all the first and second order partial derivatives needed to compute D.