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Show all work. Part A. Problems 1-5, 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  $f_x(1, 1)$ .

5. True or False.

1) The equation  $z = x^2$  is the equation for a parabola in 3 dimensions.

2)  $y = 3x + 2$  represents a line when graphed in the  $x, y, z$  coordinate system.

3) The graph of  $ax + by + cz = 0$  is a plane if  $a, b$  and  $c$  are all not 0 and the plane goes through the origin.

**PartB 6-12 10 Points each**

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

7. 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.

8. For an interest rate of 4% over 3 years what **constant** money flow has a present value of \$ 10,000 ?

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

10. 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%?

11/12. 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  $D$ .