

## MATH 234: HOMEWORK 4

DUE: FRIDAY, JULY 8 VIA ILLINOIS COMPASS

1. A health club offers memberships at a rate of \$300 per person, provided that at least 50 people join. For each member in excess of 50, the membership fee will be reduced by \$2. So for example, if 51 people join the club, the membership will be \$298 per person. Due to space limitations, at most 125 memberships will be sold. How many memberships should the club sell in order to maximize its revenue?

2. In planning a sidewalk cafe, it is estimated that if there are 28 tables, the daily profit will be \$8 per table and that, if the number of tables is increased by  $x$ , the profit per table will be reduced by  $x/4$  dollars (due to overcrowding). How many tables should be present in order to maximize the profit?

3. Compute the derivative with respect to  $r$  of  $r^2(r-1)(r+1)^{-1}$ .

4. Compute the derivative with respect to  $x$  of  $\frac{x+1}{x^2-1}$ .

5. Compute the derivative with respect to  $x$  of  $\frac{2x-7}{3x-2}$ .

6. Compute the derivative with respect to  $x$  of  $(x^3+1)(3x^2-1)$ .

7. Let  $f(x) = x^3$ . Using the chain rule, compute

$$\frac{d}{dx}f(g(x)).$$

8. Let  $g(x) = \sqrt{x}$ . Using the chain rule, compute

$$\frac{d}{dx}f(g(x)).$$

9. Let  $f(x) = x^2 - 9$  and  $g(x) = x^2 - 16$ . Compute

$$\frac{d}{dx}g(f(x)).$$

10. Let  $f(x) = 3/x + x^3$  and  $g(x) = 1 - x^2$ . Compute

$$\frac{d}{dx}f(g(x)).$$

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**11.** Suppose that  $x$  and  $y$  are related by the equation  $x^3 + (2y+1)^2 = y^2$ .

Use implicit differentiation to determine  $\frac{dy}{dx}$ .

**12.** Assume  $\frac{4}{x} + \sqrt{y} = x$ . What is the slope of the graph at the point  $(-1, 9)$ ?