

BAYLOR UNIVERSITY  
HANKAMER SCHOOL OF BUSINESS  
DEPARTMENT OF FINANCE, INSURANCE & REAL ESTATE

Problem Set #1  
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Name: \_\_\_\_\_

Show your work and write as legibly as possible. Good luck!

1. Determine the first derivative of each of the following functions:

(a)  $Y = 3 + 10X + 5X^2$

(b)  $Y = 2X(4 + X^3)$

(c)  $Y = 3X/(4 + X^3)$

(d)  $Y = 4X/(X - 3)$

2. Determine the second derivative of the following functions:

(a)  $Y = 4 + 9X + 3X^2$

(b)  $Y = 4X(3 + X^2)$

(c)  $Y = 4X(2 + X^3)$

(d)  $Y = 4/X + 3$

3. Find the partial derivative of  $Y$  with respect to  $X$  and the partial derivative of  $Y$  with respect to  $Z$  in each of the following cases:

(a)  $Y = 10 + 3Z + 2X$

(b)  $Y = 18Z^2 + 4X^3$

(c)  $Y = Z^{0.2}X^{0.8}$

(d)  $Y = 3Z/(4 + X)$

4. One very important question facing hospitals is this: How big must a hospital be (in terms of patient-days of care) to minimize the cost per patient-day? According to one well-known study, the total cost (in dollars) of operating a hospital (of a particular type) can be approximated by

$$C = 4,700,000 + 0.00013X^2,$$

where  $X$  represents the number of patient-days.

(a) Derive a formula for the relationship between cost per patient-day and the number of patient days.

(b) On the basis of the results of this study, how big must a hospital be (in terms of patient-days) to minimize the cost per patient-day?

(c) Show that your result minimizes, rather than maximizes, the cost per patient-day.