

YOUR NAME: \_\_\_\_\_

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. The product of two positive real numbers  $x$  and  $y$  is 10. What should the numbers be in order that their sum be minimum?

- (a) Write the objective function and an auxiliary equation.

**Objective:**

**Auxiliary:**

- (b) Find the numbers by minimizing the objective.

2. An open top box with square base is to have surface area equal to  $75 \text{ in}^2$ . What are the dimensions of the box that maximize the volume?

3. Artsy Baskets<sup>®</sup> can produce a hand-woven basket at a cost of \$11. The company has daily fixed costs of \$200. They estimate that the price function is  $p(x) = 50 - 1.5x$ , where  $p$  is the price in dollars at which  $x$  baskets will be sold.

- (a) Find the cost, revenue and profit functions.

$$C(x) =$$

$$R(x) =$$

$$P(x) =$$

- (b) How many baskets should be produced daily and how should they be priced to maximize the company's profit?

4. Find  $\frac{dy}{dx}$  if  $xy^2 - x^2y = 12$ .

5. (a) Find the present value of a future amount of \$10,000 payable in 10 years time under a fixed annual interest rate of 6% compounded bimonthly (every two months).

(b) How many years does it take for an amount deposited in an account yielding 3% compounded continuously to triple in value?