

Name: _____

Please show your work. No credit will be assigned for problems where an answer was obtained without an explanation.

1. (10 points) A company has fixed costs of \$300 and variable costs given by $\frac{3}{4}x + 1460$ dollars per unit where x is the total number of units produced. The selling price is $1500 - \frac{1}{4}x$ dollars per unit.

(a) Write down the profit function.

(b) Find the break-even points.

(c) How many units should be produced so that the profit is maximum?

2. (10 points) Sketch the graph of the function

$$g(x) = \begin{cases} x^2, & \text{if } x \leq 1 \\ 4 - x, & \text{if } x > 1. \end{cases}$$

Find $f(-1)$, $f(4)$.

3. (10 points) Determine if the system of equations below has any solutions. If a solution exists, find it. Show all work.

$$x + y + z = 3$$

$$3x - 5y + 4z = 3$$

$$x + 2y + z = 4$$

4. (10 points) Given the matrices

$$A = \begin{bmatrix} 1 & 5 & 2 \\ -2 & 0 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 6 \\ 2 & -1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & -2 \\ 0 & 2 \end{bmatrix},$$

perform the indicated operations if possible. If an operation is not possible, explain why.

(a) $2A$

(b) $B+C$

(c) AB

(d) BA

5. (10 points) A firm manufactures bumper bolts and fender bolts for cars. One machine can produce 130 fender bolts per hour, and another machine can produce 120 bumper bolts per hour. The combined number of fender bolts and bumper bolts the packaging department can handle is 230 per hour. How many of each type of bolt should the firm produce hourly to maximize its sales if fender bolts sell for \$1 and bumper bolts sell for \$2?

6. (Bonus: 10 points) Use the augmented matrix method to find the inverse of the given matrix. Show all work.

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}$$