MATH 141 (Extra Practice 1)

1. If matrices $A = \begin{bmatrix} w & -0.5 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & -1 \\ y & 2 \end{bmatrix}$ are inverses of each other, what are the values of y and w?

2. The company that produces a toothpaste has a fixed costs of \$5000. It costs \$4.25 to produce each tube of toothpaste. If they sale $6,000$ tubes of Tasty Toothpaste, they make a profit of $\$2,380$. How much does each tube of toothpaste sell for?

3. Perform the indicated row operation: $\left[\begin{array}{cc|c} 1 & 2 & 1 \\ 2 & 3 & -1 \end{array}\right] \begin{array}{c} R_2 - 2R_1 \\ \longrightarrow \end{array}$

4. A firm must purchase a total of 100 computers, some of small, some of medium, and some of large capacity. The small capacity computers cost \$2000 each, the medium capacity computers cost \$6000 each, and the large capacity computers cost \$8000 each. If the firm plans to spend all of $\$400,000$ on the total purchase, find the number of each type to be bought.

   (a) Define the variables that are used in setting up the system of equations.

(b) Set up the system of equations that represents this problem.

(c) Solve for the solution. *If the solution is unique list it. If NO SOLUTION, say so. If more than one solution, write it in parametric form, then tell what restrictions should be placed on the parameter(s); also give one specific solution.*

5. Pivot the system about the boxed element:

   (a) $\left[\begin{array}{cc|c} \boxed{2} & 4 & 8 \\ 3 & 1 & 2 \end{array}\right]$

   (b) $\left[\begin{array}{ccc|c} 1 & 2 & 3 & 5 \\ 0 & \boxed{-3} & 3 & 2 \\ 0 & 4 & -1 & 3 \end{array}\right]$

6. Solve the following system of linear equations:

$$\begin{aligned} -10x + 2y &= 8 \\ -y &= 4 - 5x \\ 2 &= 2x - 3y \end{aligned}$$

7. When a heater is priced at \$120, then 8000 heaters are demanded. 3000 heaters are demanded when the price is \$230. The supply equation for this heater is $0.025x - p + 89.2 = 0$, where x is the number of heaters and p is the price of each heater. What is the equilibrium quantity for this particular heater?

8. Let

$$A = \begin{bmatrix} 5 & k & 2 \\ -1 & 6 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & -1 & 5 \\ 8 & 2 & x \end{bmatrix} C = \begin{bmatrix} 34 & 36 \\ 5m & -2 \end{bmatrix}$$

Given that $AB^T = C$, find the value for x.

9. Solve for p, j, x, w if

$$-2 \begin{bmatrix} 3 & w \\ 1 & 4-x \end{bmatrix} - \frac{1}{2} \begin{bmatrix} 1 & -3 \\ -2 & -8 \end{bmatrix} = \begin{bmatrix} j & p-9 \\ -1 & 6 \end{bmatrix}^T$$

10. Let A be a 5x6 matrix, B be a 5x5 singular matrix, C be a 6x6 nonsingular matrix, and I be the 6x6 Identity matrix. CLEARLY CIRCLE either TRUE or FALSE for each of the statements below.

(a) TRUE FALSE It is possible to compute: $C^{-1}C^2C^T$.

(b) TRUE FALSE It is possible to compute: $C(2A^T - 6B)$

(c) TRUE FALSE It is possible to compute: $B^{-1}AC$

(d) TRUE FALSE $CC^{-1} = C^{-1}C$

(e) TRUE FALSE It is possible to compute: $18BA^2$

11. Manuel had two hours to spend at the gym, where he plans to run, bike, and lift weights. Running burns 15 calories per minute, biking 10 calories per minute, and lifting weights 5 calories per minute. Manuel plans to spend exactly twice as much time running as he does biking and he wants to burn 1250 calories total. How many minutes should he run, bike, and lift weights?

    (a) Define the variables and set up the equations.

    (b) How long should he spend biking?

12. A company will supply 1200 benches when the unit price is \$80. If the unit price increases by \$15, they are willing to make an additional 500 benches available. How many benches will they make available if the unit price is \$115? (round to the nearest bench).

13. A company owns a machine that is presently worth $\$5,200$. Seven years ago, they bought the machine for $\$13,500$. How much will the machine be worth two years from now?

14. The systems of equations below are already in RREF form.

    (a) Write out the solution in (x, y, z) form.

    $$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 1 \end{array}\right]$$

    (b) Write out the solution in (x, y, z, w) form.

    $$\left[\begin{array}{cccc|c} 1 & 0 & 1 & 0 & 5 \\ 0 & 1 & 0 & 0 & 8 \end{array}\right]$$

15. For a price of \$12 each, a certain manufacturer will market 2000 books. For each \$3 increase in the price, the manufacturer will market an additional 800 books. Find the supply equation.

16. A movie called opened few months ago. The table below represents the weekend gross (in thousands of dollars) for several of the weekends during the few months it was in theaters. (1 = 1st weekend it was out, 3 = 3rd weekend, etc...)

Weekend	1	3	5	8
Weekend Gross	75.34	58.75	44.22	23.54

    Based on the line of best fit for this data, estimate the weekend gross for the 9th weekend.

Answers

1. $y = 6, w = -1$
2. \$5.48
3. $\left[\begin{array}{cc|c} 1 & 2 & 1 \\ 0 & -1 & -3 \end{array}\right]$
4. (c)$(x, y, z) = (0.5t+50, 50-1.5t, t)$ where t is an even integer with $0 \leq t \leq 32$; specific solution (for example): if $t = 30$ then 65 small computers, 35 medium, and 30 large capacity computers.
5. (a) $\left[\begin{array}{cc|c} 1 & 2 & 4 \\ 0 & -5 & -10 \end{array}\right]$

   (b) $\left[\begin{array}{ccc|c} 1 & 0 & 5 & 19/3 \\ 0 & 1 & -1 & -2/3 \\ 0 & 0 & 3 & 17/3 \end{array}\right]$
6. NO SOLUTION
7. 4400
8. $x = 2$
9. $x = 5, j = -6.5, w = 1.25, p = 8$
10. (a) TRUE, (b) FALSE, (c) FALSE, (d) TRUE, (e) FALSE
11. (a) Let x = the # of minutes running y = the # of minutes biking z = the # of minutes lifting weights Then, $x + y + z = 120, \quad 15x + 10y + 5z = 1250, \quad x = 2y$ (b) 26 minutes.
12. 2367
13. \$2,828.57
14. (a) NO SOLUTION (b) $(x, y, z, w) = (5 - t, 8, t, s)$, where t and s are any real number
15. $y = \frac{3}{800}x + 4.5$
16. \$15,5