Math 141 - Exam 1 Review Answer Key

1. $y = -\frac{5}{3}x$

2. $y = \frac{3}{5}x + \frac{33}{5}$

3. $y = \frac{1}{2}x - 4$

4. $x = -7$

5. $y = 4x - 160$

6. (a) TRUE
(b) FALSE
(c) FALSE
(d) FALSE
(e) TRUE
(f) FALSE
(g) FALSE
(h) FALSE
(i) FALSE
(j) TRUE

7. I decided to change the equations in the problem so that the numbers worked out nicely. Using the demand equation $31x + 11y - 825 = 0$ and the supply equation $-14x + 11y - 330 = 0$, the equilibrium quantity is $x = 11$ and the equilibrium price is $y =$\$44.

8. Again, to make the numbers work out nicely, I changed the selling price per unit to 1.5 Galleons (instead of 2 Galleons). With this change, the answers are as follows:
(a) production cost per unit = 0.25 Galleons
(b) $C(x) = 0.25x + 15$
(c) $R(x) = 1.5x$
(d) $P(x) = 1.25x - 15$
(e) $(12, 18)$

9. $k = -\frac{6}{5}$

10. (a) $y = 0.9857x + 35.3571$
(b) \$35,145
(c) $r = 0.9120$ Since the correlation coefficient r is very close to 1, the data have a strong linear relationship.

11. (a) Not in row-reduced form. Column 3 has a leading 1, but it is not a unit column (all other entries in column 3 should be 0).
(b) Is in row-reduced form. Unique solution: $x = 5, y = 3$
(c) Is in row-reduced form. Infinitely many solutions: Let $y = t$ where t is any real number. Then the parametric solution is $(-3t + 5, t, -7)$.
(d) Not in row-reduced form. The first nonzero entry in row 2 is not a 1.
(e) Is in row-reduced form. No solution.
(f) Not in row-reduced form. The leading 1 in the second row lies to the left of the leading 1 in the row above it.
(g) Not in row-reduced form. The row of all zeros should be below all rows with nonzero entries.

12. (a) Let x equal the amount of money invested in the high risk stock.
Let y equal the amount of money invested in the medium risk stock.
Let z equal the amount of money invested in the low risk stock.
Then $x = \$75,000$, $y = \$200,000$, $z = \$25,000$

(b) Let x equal the number of small sodas sold that day.
Let y equal the number of medium sodas sold that day.
Let z equal the number of large sodas sold that day.
Then the parametric solution is $(t-2, -2t+25, t)$ where $t = 2, 3, 4, \ldots, 12$. To find a specific (particular) solution, pick any of the possible values of t from the list and substitute that value into the parametric solution.

13. The final matrix will be $\left[\begin{array}{ccc|c} 1 & -2 & 0 & 3 \\ 0 & 18 & -8 & -15 \\ 0 & 1 & 1 & 3 \end{array}\right]$.

14. I made another change to the problem here. In the second matrix, I changed the $x-7$ in the row 3, column 1 position to just x, and in the third matrix, I changed the $y-1$ in the row 1, column 1 position to just y. After making these changes, you find $x = -2$, $y = -\frac{5}{4}$, $z = -\frac{8}{3}$, and $u = \frac{2}{3}$.

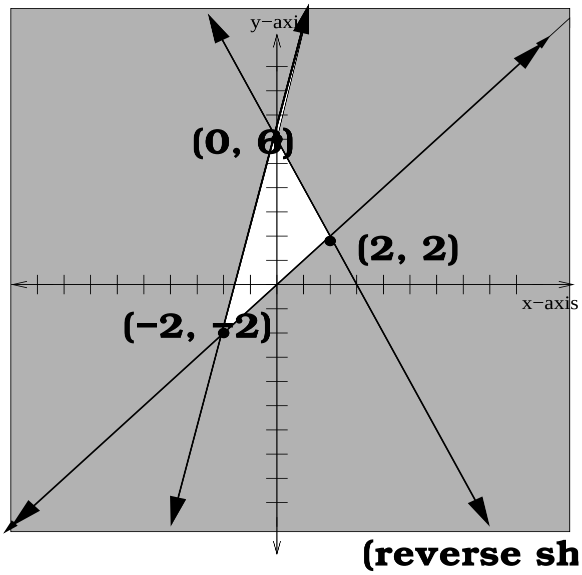
15. $A = \begin{bmatrix} 22 & -21 \\ 26 & -33 \end{bmatrix}$

16. (a) Not possible. Matrices must be the same size (have the same dimensions) to add.
(b) Result will be 3×3. (Use your calculator to find the exact answer.)
(c) Not possible. D^{-1} is 3×3 and C is 2×3. Since the number of columns of D^{-1} does not equal the number of rows of C, these matrices cannot be multiplied in the given order.
(d) Result will be 2×3. (Use your calculator to find the exact answer.)
(e) $I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, the 3×3 identity matrix
(f) Not possible since E is singular (i.e., E^{-1} does not exist).
(g) Not possible. The number of columns of C is not equal to the number of rows of A.
(h) Not possible. C is not a square matrix, so it cannot have an inverse.

17. in text

18. $x = \frac{35}{3}, y = -\frac{77}{9}, z = -\frac{7}{9}$

19. I'm sorry about the crazy font on the graphic–it's the best I could do on short notice. Reverse shading is demonstrated.



20. Let x equal the number of ounces of chicken that should be used in each bag.
Let y equal the number of ounces of grain that should be used in each bag.

Minimize Cost $C = 10x + y$
subject to $10x + 2y \geq 200$
$5x + 2y \geq 150$
$x \geq 0$, $y \geq 0$