KEY - Practice Exam 1 - KEY
Math 166

1. Find the equation of the line through:
   a. (1,3) and (4,6)

      $y = x + 2$

   b. (2,4) and (2,6)

      $x = 2$

   c. (1,6) and (π , 6)

      $y = 6$

2. Find the equation of the line through the point (1,2) that is parallel to the line $y = 3x + 6$

   $y = 3x - 1$

3. The number of times a snow cricket chirps per minute is a linear function of temperature. At 10° F it chirps 15 times per minute, but at 15° F it chirps 18 times per minute. Find the equation of the line that gives chirp rate as a function of temperature.

   $y = (3/5)x + 9$

$$A = \begin{bmatrix} -2 & -3 & 6 \\ -1 & -1 & 6 \\ 1 & 7 & -5 \end{bmatrix}, \qquad B = \begin{bmatrix} 0 & 0 & 1 \\ 0 & x & 0 \\ 1 & 0 & 0 \end{bmatrix}, \qquad C = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

4. Use the matrices above. If G = 3A+ 2B then $G_{3,\,2}$ = ???

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5. Use the matrices above. Find the product AB if possible.

$$\mathbf{AB} = \begin{bmatrix} 6 & -3x & -2 \\ 6 & -x & -1 \\ -5 & 7x & 1 \end{bmatrix}$$

6. Use the matrices above. Find the product BC if possible.

$$\mathbf{BC} = \begin{bmatrix} z \\ xy \\ x \end{bmatrix}$$

7. Use the matrices above. Find the product CB if possible.

CB is not defined.

8. Use the matrices above. If G = $A^{-1} + A^{T}$ then $G_{1,2}$ = ???

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9. Your company makes three types of pendants. Each pendant uses three machines according to the table below. There is limited time available on each machine. Use the method of matrix inverses to determine how many of each type of pendant should be made in order to exactly use up the available time on each machine.

	$Pendant A$	$Pendant B$	$Pendant C$	$Time\ available\ per\ day$
$machine I$	$2 min$	$3 min$	$1 min$	$400 min$
$machine II$	$1 min$	$2 min$	$1 min$	$275 min$
$machine III$	$1 min$	$4 min$	$0 min$	$275 min$

Make 75 pendant A,
50 pendant B and
100 pendant C each day.

10. For what value of k does the system below have no solution?

$$2x + y = 6$$
$$x + ky = 1$$

k = ½

11. Which of the below row reduced matrices indicates that the original system has no solutions? You may choose more than one of the matrices.

$$\mathbf{A} = \left|\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 1 & 3 \\ 0 & 0 & 0 & 0 \end{array}\right| \qquad \mathbf{B} = \left|\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \end{array}\right| \qquad \mathbf{C} = \left|\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 1 \end{array}\right|$$

Only matrix C has no solutions.

12. Given that: x = the number of one bedroom units built and
y = the number of three bedroom units built

Which equation or inequality describes the requirement that there must be exactly three times as many one bedroom units as three bedroom units?

a. $x < 3y$

b. $x = 3y$

c. $y = 3x$

d. $3x + y = 0$

e. none of these

13. Given that: x = the number of one bedroom units built and
y = the number of three bedroom units built

Which equation or inequality which describes the requirement that there must be AT LEAST three times as many one bedroom units as three bedroom units.

a. $x < 3y$

b. $x \leq 3y$

c. $y = 3x$

d. $x \geq 3y$

e. none of these

14. Graph the following set of inequalities. Label all corner points correct to at least 3 significant digits.

$$
\begin{aligned}
-x + y &\leq 0 \\
x + y &\leq 20 \\
8x + 30y &\leq 240 \\
x &\geq 0 \\
y &\geq 0
\end{aligned}
$$

The graph is left for you to check.
The corner points should be:
(0, 0)
(6.3158, 6.3518),
(180/11, 40/11) and
(20, 0)

15. Graph the following set of inequalities. Label all corner points correct to at least 3 significant digits.

$$\begin{aligned} -x + y &\geq 0 \\ x + y &\geq 20 \\ 8x + 30y &\geq 240 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

Again the graph is left for you.
The corner points should be:
(0, 20)
(0, 8)
(10, 10) and
(6.3158, 6.3158)

16. Solve the below system of equations using Gauss-Jordan.

$$\begin{aligned} 3x - 6y + 3z &= -9 \\ 2x + y - 2z &= 2 \\ 2x - 4y + 2z &= -6 \end{aligned}$$

How many solutions does the system have?
If there are an infinite number of solutions describe all solutions using parameters and list two specific solutions.

Details are left for you to do.
There are an infinite number of solutions of the form:

$$x = (3/5)t + (1/5)$$
$$y = (4/5)t + (8/5)$$
$$z = t$$

17. Solve the below system of equations using any method.

$$\begin{array}{llll} 3x & -6y & +4z & = -9 \\ (3/2)x & -3y & +2z & = 2 \end{array}$$

How many solutions does the system have?
If there are an infinite number of solutions describe all solutions using parameters and list two specific solutions.

There are NO solutions.
(Gauss Jordan will be the only viable method to use)

18. Solve the below system of equations using any method.

$$\begin{array}{llll} 2x & +3y & -2z & = 10 \\ 3x & -2y & +2z & = 0 \\ 4x & -y & +3z & = -1 \\ 8x & & +7z & = 9 \end{array}$$

How many solutions does the system have?
If there are an infinite number of solutions describe all solutions using parameters and list two specific solutions.

Again only Gauss Jordan can be used and again there are NO solutions.

19. A nutritionist at the medical center has been asked to prepare a diet. Minimum Requirements per meal: 400 mg of calcium, 10 mg of iron, and 40 mg of vitamin C. The meals will be prepared from foods A & B. Each ounce of food A contains: 30 mg calcium, 1 mg iron, 2 mg vitamin C, and 2 mg cholesterol. Each ounce of food B contains: 25 mg calcium, .5 mg iron, 5 mg vitamin C, and 5 mg cholesterol.

    Set up but do not solve a linear program that determines the number of ounces of each type of food that should be used so that the cholesterol content is minimized, and the requirements are met.

Variable definitions:

a = the number of ounces of food A in a meal
b = the number of ounces of food B in a meal

Linear program:

Minimize C = 2a + 5b, subject to:

$$
\begin{aligned}
30a + 35b &\geq 400 \\
a + \tfrac{1}{2}b &\geq 10 \\
2a + 5b &\geq 40 \\
a &\geq 0 \\
b &\geq 0
\end{aligned}
$$