

CHAPTER 4 REVIEW WS

Name: KEY

Date: _____ Period: _____

Part I: Solve the system of equations by the indicated method:

1. LINEAR COMBO (Elimination)

$$\begin{cases} \frac{2}{x} - \frac{5}{y} = 26 \\ \frac{3}{x} + \frac{4}{y} = 16 \end{cases} \quad \begin{array}{l} \text{let } a = \frac{1}{x} \\ b = \frac{1}{y} \end{array}$$

$$\begin{cases} 2a - 5b = 26 \\ 3a + 4b = 16 \end{cases}$$

(a, b) is $(8, -2)$

so
 (x, y) is $(\frac{1}{8}, -\frac{1}{2})$

2. SUBSTITUTION

$$\begin{cases} 2x + 4y = -4 \\ x + 2y = 20 \end{cases}$$

$0 \neq -24$

No solution,
parallel lines.

3. MATRICES

$$\begin{cases} 2x - 3y = 16 \\ 5x + 6y = 22 \end{cases}$$

$$A = \begin{bmatrix} 2 & -3 & 16 \\ 5 & 6 & 22 \end{bmatrix}$$

$$\text{rref } A = \begin{bmatrix} 1 & 0 & 6 \\ 0 & 1 & -\frac{4}{3} \end{bmatrix}$$

$(6, -\frac{4}{3})$

4. USE ANY METHOD

$$\begin{cases} y = -\frac{2}{3}x + 4 \\ -4x - 6y = -24 \end{cases}$$

Substitution is probably quickest:

$$-4x - 6(-\frac{2}{3}x + 4) = -24$$

$$-4x + 4x - 24 = -24$$

$$-24 = -24$$

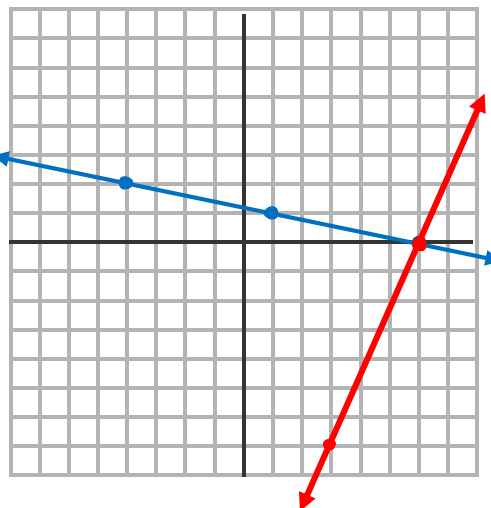
$$0 = 0$$

Infinitely many solutions on the line $y = -\frac{2}{3}x + 4$

5. GRAPHICALLY

$$\begin{cases} -x - 5y = -6 \\ y = \frac{7}{3}x - 14 \end{cases} \quad \begin{array}{l} \text{start at } (6, 0) \text{ ; use} \\ m = -\frac{1}{5} \end{array}$$

Solution: $(6, 0)$



Part II: Operations with Matrices. To be done without your calculator. Show your work.

6. $\begin{bmatrix} 2 & -5 \\ 9 & -6 \end{bmatrix} - 2 \begin{bmatrix} -7 & 1 \\ 6 & 10 \end{bmatrix}$

$$\begin{bmatrix} 2 & -5 \\ 9 & -6 \end{bmatrix} + \begin{bmatrix} 14 & -2 \\ -12 & -20 \end{bmatrix}$$

$$\begin{bmatrix} 16 & -7 \\ -3 & -26 \end{bmatrix}$$

7. $\begin{bmatrix} 2 & -5 \\ 9 & -6 \end{bmatrix} \cdot \begin{bmatrix} -7 & 1 \\ 6 & 10 \end{bmatrix}$
 $2 \times 2 \cdot 2 \times 2$

$$\begin{bmatrix} -14 + -30 & 2 - 50 \\ -63 - 36 & 9 - 60 \end{bmatrix}$$

$$\begin{bmatrix} -44 & -48 \\ -99 & -51 \end{bmatrix}$$

Part III: f(x) Notation

Given: $f(x) = x^2 - 2x$ and $g(x) = 3x - 1$

8. Find $f(-5)$

$$f(-5) = (-5)^2 - 2(-5) \\ = 25 + 10$$

$$f(-5) = 35$$

9. Find $f(g(x))$

$$f(3x-1) = (3x-1)^2 - 2(3x-1) \\ = 9x^2 - 6x + 1 - 6x + 2$$

$$= 9x^2 - 12x + 3$$

10. Find $g(f(9))$

$$f(9) = 9^2 - 2(9) \\ = 81 - 18 = 63 \\ f(9) = 63$$

$$g(63) = 3(63) - 1 \\ = 188$$

Given: $f(x) = 3x - 5$, $g(x) = 2x^2 - 3x + 7$, and $h(x) = x + 1$

11. Find $g(-2)$

$$g(-2) = 2(-2)^2 - 3(-2) + 7 \\ = 8 + 6 + 7$$

$$g(-2) = 21$$

12. Find $f(g(x))$

$$f(2x^2 - 3x + 7) = 3(2x^2 - 3x + 7) - 5 \\ = 6x^2 - 9x + 21 - 5$$

$$= 6x^2 - 9x + 16$$

13. Find $g(h(x))$

$$g(x+1) = 2(x+1)^2 - 3(x+1) + 7 \\ = 2(x^2 + 2x + 1) - 3x - 3 + 7$$

$$= 2x^2 + x + 6$$

Part IV: Linear Modeling

Set up but **DO NOT SOLVE** the following models using two or three variables.

14. A theater group sold a total of 440 tickets for \$3940. Each regular ticket costs \$5, each premium costs \$15. How many of each type were sold?

$$\begin{array}{l} \text{let } x = \# \text{ of reg. tix} \\ y = \# \text{ of premium tix} \end{array} \quad \left\{ \begin{array}{l} x + y = 440 \\ 5x + 15y = 3940 \end{array} \right.$$


15. Ben Hongre goes to the grocery store to buy some fruit. Ben needs to buy 210 pieces of fruit. Each apple costs 15 cents a piece and each orange costs 10 cents a piece. If Ben Hongre spends \$27.10, how many apples and oranges did Ben buy?

$$\begin{array}{l} \text{let } x = \# \text{ of apples bought} \\ y = \# \text{ of oranges bought} \end{array} \quad \left\{ \begin{array}{l} x + y = 210 \\ .15x + .10y = 27.10 \end{array} \right.$$

16. John inherited \$25,000 and invested part of it in a money market account, part in municipal bonds, and part in a mutual fund. After one year, he received a total of \$1,620 in simple interest from the three investments. The money market paid 6% annually, the bonds paid 7% annually, and the mutual fund paid 8% annually. There was \$6,000 more invested in the bonds than the mutual funds. Find the amount John invested in each category.

$$\begin{array}{l} \text{let } x = \text{amount of money in } 6\% \text{ bond} \\ y = \text{ " " " in } 7\% \text{ bond} \\ z = \text{ " " " in } 8\% \text{ bond} \end{array} \quad \left\{ \begin{array}{l} x + y + z = 25,000 \\ .06x + .07y + .08z = 1620 \\ y = 6000 + z \end{array} \right.$$

17. A rectangle is three times as long as it is wide. Its perimeter is 80 cm. Find its dimensions.


$$\begin{array}{l} \text{let } w = \text{width} \\ l = \text{length} \end{array} \quad \left\{ \begin{array}{l} 2l + 2w = 80 \\ l = 3w \end{array} \right.$$

18. Molly's Custom Kitchen Supplies sells handmade forks and spoons. It costs the store \$1.70 to buy the supplies to make a fork and \$1.30 to buy the supplies to make a spoon. The store sells forks for \$5.60 and spoons for \$5.40. Last April, Molly's Custom Kitchen Supplies spent \$37.90 on materials for forks and spoons. They sold the finished products for a total of \$147.20. How many forks and how many spoons did they make last April?

$$\begin{array}{l} \text{let } f = \# \text{ of forks made} \\ s = \# \text{ of spoons made} \end{array} \quad \left\{ \begin{array}{l} 1.70f + 1.30s = 37.90 \\ 5.60f + 5.40s = 147.20 \end{array} \right.$$

19. A vendor sells hot dogs, chips, and drinks. A customer buys 2 hot dogs, 5 chips, and 2 drinks for 10.50. The price of 1 hot dog is \$0.50 more than price of 1 chips. One drink is \$1.75 less than the price of 2 hot dogs. Find the cost of each item.

$$\begin{array}{l} \text{let } x = \# \text{ of hot dogs sold} \\ y = \# \text{ of chips sold} \\ z = \# \text{ of drinks sold} \end{array} \quad \left\{ \begin{array}{l} 2x + 5y + 2z = 10.50 \\ x = .50 + y \\ z = 2x - 1.75 \end{array} \right.$$

SOLVE the following system of equations:

20. At Annie Moore's Coffee Shop, the waitress earns \$16 and the cook earns \$24 in a normal shift. In addition, the waitress gets 70% of the tip money received, and the cook gets 30%.

Let t = total dollars in tips received in a shift.

Let $w(t)$ = total dollars the waitress gets in a shift

Let $c(t)$ = total dollars the cook gets in a shift.

a. Write equations expressing $w(t)$ and $c(t)$

$$w(t) = .70t + 16$$

$$c(t) = .30t + 24$$

b. Calculate $w(5)$ and $c(5)$

$$\begin{aligned} w(5) &= .70(5) + 16 \\ &= \$19.50 \end{aligned}$$

If they only make \$5 in tips,
the cook makes \$6 more.

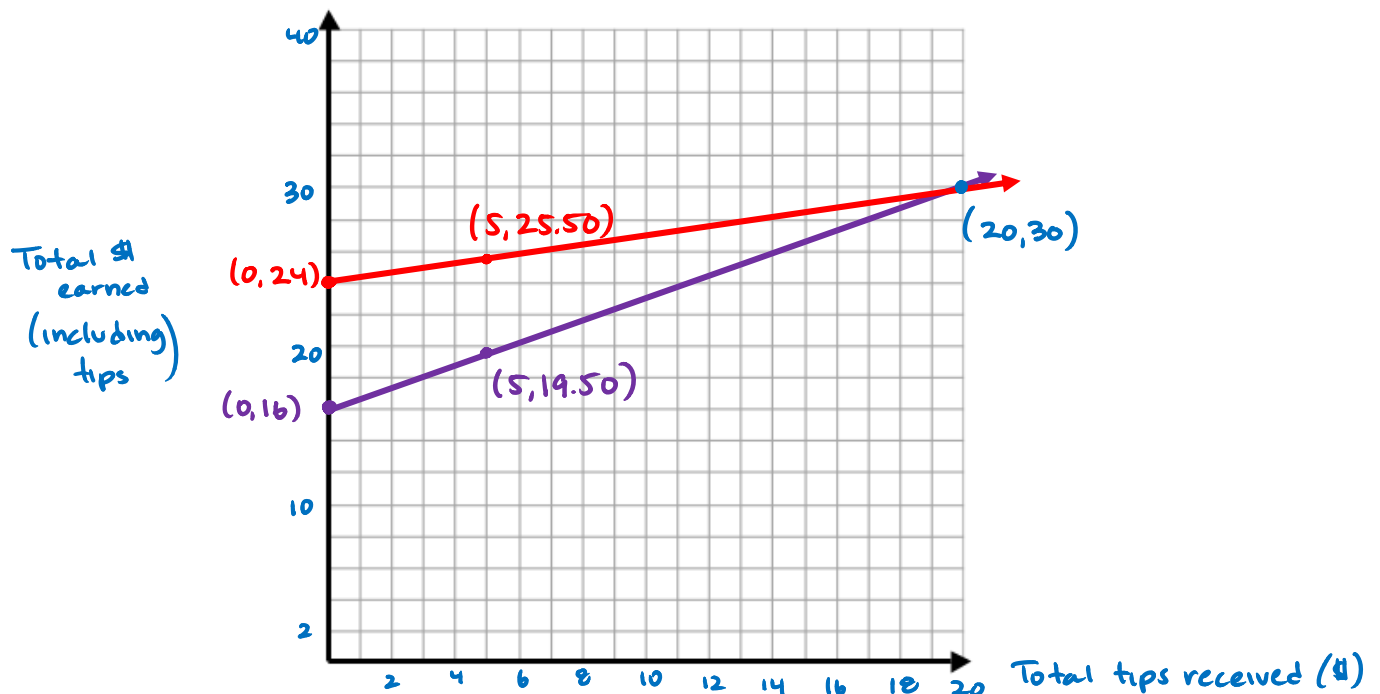
$$\begin{aligned} c(5) &= .30(5) + 24 \\ &= \$25.50 \end{aligned}$$

c. How much would have to be received in tips for the waitress and the cook to break even?

$$\begin{aligned} .70t + 16 &= .30t + 24 \\ .40t &= 8 \\ t &= \$20 \end{aligned}$$

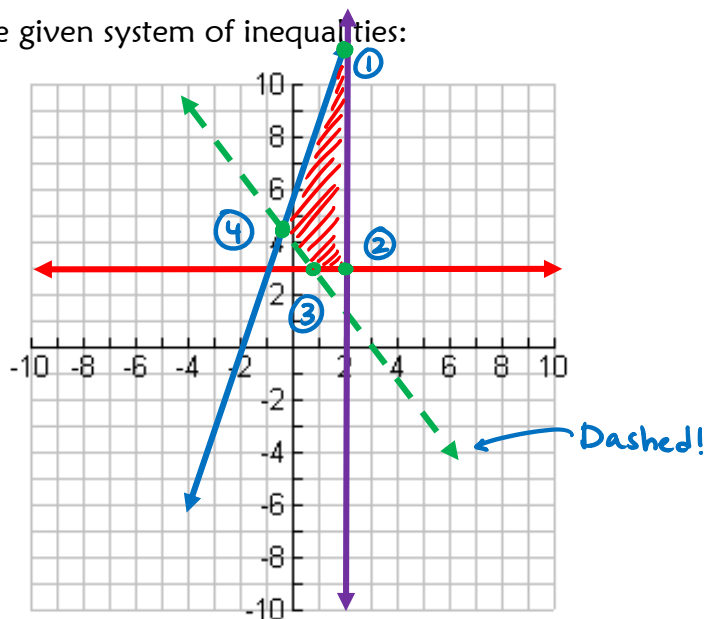
They need \$20 in tips in order
for both the cook & waitress to
earn the same amount: \$30.

d. Plot the graphs of $w(t)$ and $c(t)$ to show your answer in part C is correct.



21. Graph and shade the solution area to the given system of inequalities:

$$\begin{cases} \text{A } x \leq 2 \\ \text{B } y \geq 3 \\ \text{C } 4x + 3y > 12 \\ \text{D } -\frac{x}{2} + \frac{y}{6} \leq 1 \end{cases}$$



a. Name two possible solutions to the system above.

Anything in the red shaded region.
ex: (0,5) (1,6)

b. Find all 4 corner points ALGEBRAICALLY.

<p>Pt 1 A & D</p> $x = 2 \quad -\frac{x}{2} + \frac{y}{6} = 1$ $\frac{-2}{2} + \frac{y}{6} = 1$ $-1 + \frac{y}{6} = 1$ $y = 12$ <p>(2, 12) closed</p>	<p>Pt 2 A & B</p> $x = 2 \quad y = 3$ <p>(2, 3) closed</p>	<p>Pt 3 C & B</p> $4x + 3y = 12 \quad y = 3$ $4x + 3(3) = 12$ $4x = 3$ $x = \frac{3}{4} \quad y = 3$ <p>($\frac{3}{4}, 3$) open</p>	<p>Pt 4 C & D</p> $4x + 3y = 12$ $-\frac{x}{2} + \frac{y}{6} = 1$ $-3x + y = 6$ $y = 3x + 6 \quad \text{use sub.}$ $4x + 3(3x + 6) = 12$ $4x + 9x + 18 = 12$ $13x = -6$ $x = -\frac{6}{13} \quad y = \frac{60}{13}$ <p>($-\frac{6}{13}, \frac{60}{13}$) open</p>
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c. Are all 4 corner points solutions to the given system? Explain why or why not.

Only points 1 & 2 are solutions to the system
b/c they are closed circles (from \leq or \geq inequality).

#22. MATRIX APPLICATION: (EXTRA CREDIT BONUS PROBLEM)

A roofer needs plywood, building paper, shingles, nails and flashing material. He has three distributors available to him. Distributor #1 charges \$8 per unit of plywood, \$10 per unit of building paper, \$30 per unit of shingles, \$2 per unit of nails, and \$6 per unit of flashing. Distributor #2 charges \$6, \$8, \$35, \$3, and \$5 per unit, respectively. Distributor #3 charges \$10, \$6, \$32, \$2, and \$7 per unit, respectively.

a) Put this information into an appropriate matrix. Show your labels.

The roofer has two jobs for which he must buy material. The first job requires 6 units of plywood, 7 units of building paper, 20 units of shingles, 8 units of nails, and 3 units of flashing. The second job requires 100, 10, 30, 12, and 8 units of these materials.

b) Put this information into an appropriate matrix. Show your labels.

It takes the roofer different amounts of time to install these products. For each unit of plywood to be put down it takes the roofer 20 minutes; for each unit of building paper, 10 minutes; for each unit of shingles 1 hour; for each unit of nails, 30 minutes; and for each unit of flashing 25 minutes.

c) Put this information into an appropriate matrix. Show your labels.

d) Using matrix multiplication, find how much it will cost the roofer to get all of his supplies for each of the jobs from the different distributors.

e) Using matrix multiplication, find how long it will take the roofer to complete each of the jobs.

f) If the roofer wishes to buy all the material for each job from one distributor (they will deliver the goods to the site at no extra cost that way), which distributor should he choose for each of the jobs?