Name: __Solutions__

## Math 125 Test 4 - Sample

Show all work in an organized manner. No partial credit will be given if I cannot easily determine what you did. Write answers as ordered pairs where appropriate. Take time to check! Because this is a take home test I expect exceptional work. Partial credit will be limited.

(1) Solve the system $\begin{cases} x + 2y = 6 \\ 2x - y = 7 \end{cases}$ three different ways as requested below. No credit if the wrong method is used. In part (d) you are asked to check.

(a) Solve by graphing. Label the graphs (which is which?) and label one point on each graph. (10 points)

$$\underline{X + 2Y = 6}$$

X	Y
6	0
0	3
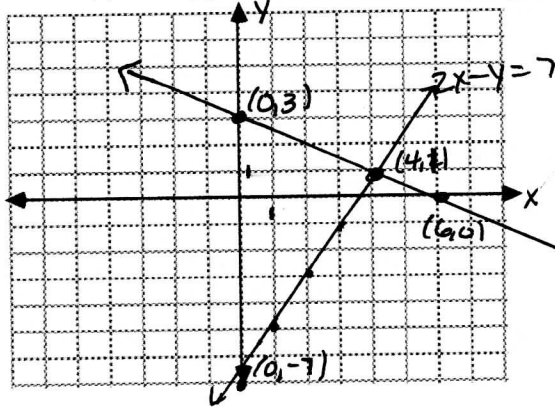
$$\underline{2X - Y = 7}$$

$Y = 2X - 7$

$Y-int -7$

$m = 2 = \frac{2}{1}$ up 2 rt 1

Soln: $(4, 1)$ ← state solution clearly

(b) Solve the system using the __substitution method__. (7 points)

$\begin{cases} x + 2y = 6 \\ 2x - y = 7 \end{cases} \rightarrow \begin{cases} x = 6 - 2y \\ 2x - y = 7 \end{cases} \Rightarrow$

solve for either variable and substitute. I chose X.

$2(6 - 2y) - y = 7$

$12 - 4y - y = 7$

$12 - 5y = 7$

$-5y = -5$

$y = 1$

Find corresp X.

$x = 6 - 2y$

$x = 6 - 2(1)$

$x = 4$

$(4, 1)$

(c) Solve the system using the __elimination method__. (7 points)

$\begin{cases} x + 2y = 6 \\ 2x - y = 7 \end{cases}$ Mult(2)

underbrace: eliminating y

$\begin{cases} x + 2y = 6 \\ 4x - 2y = 14 \end{cases}$ Add

$5x = 20$

$x = 4$

$(4, 1)$

$\begin{cases} x + 2y = 6 \text{ mult}(-2) \\ 2x - y = 7 \end{cases}$

underbrace: eliminating x

$\begin{matrix} -2x - 4y = -12 \\ 2x - y = 7 \end{matrix} \Big\} \text{ add}$

$-5y = -5$

$y = 1$

(d) Show a __complete__ check to the answer in part c. (3 points)

$\begin{cases} x + 2y = 6 \\ 2x - y = 7 \end{cases}$

$4 + 2(1) = 6$? $6 = 6$ ✓

$2(4) - 1 = 7$? $7 = 7$ ✓

Works in both.

← Should get Some Solution for all !!!

Note: These can all be easily _checked_.

You can use either method - Solutions show my approach

(2) Solve using any method. State the <u>name of the method</u> you use. Show all steps clearly. (7 points each)

(a) $\begin{cases} 2x+10y=3 \\ x=1-5y \end{cases}$

Substitution

$2(1-5y)+10y=3$

$2-10y+10y=3$

$2=3$

Variables drop out
False Statement.

No solution, system
is inconsistent.

or can write $\emptyset$.

$\{\emptyset\}$ is not correct notation

(b) $\begin{cases} 3x-2y=6 \\ x-2=y \end{cases}$

Substitution

$3x-2(x-2)=6$

$3x-2x+4=6$

$x+4=6$

$x=2$

Find corresponding y

$y=x-2=2-2=0$

$(2,0)$

(c) $\begin{cases} 4x-2y=10 \\ 2x+3y=-7 \end{cases}$ Mult(-2)

$\begin{array}{l} 4x-2y=10 \\ -4x-6y=14 \end{array}$

Elimination

$\dfrac{-8y=24}{-8 \quad 8}$

$y=-3$

Find corresp. x

$2x+3y=-7$

$2x+3(-3)=-7$

$2x-9=-7$

$2x=2$

$x=1$

$(1,-3)$

(d) $\begin{cases} \frac{1}{5}x+\frac{2}{3}y=-\frac{8}{5} \\ 3x-y=9 \end{cases}$ Mult(15) to clear fractions

$15\cdot\frac{1}{5}x+15\cdot\frac{2}{3}y=15\cdot\left(-\frac{8}{5}\right)$

$3x+10y=-24$

$\begin{cases} 3x+10y=-24 \\ 3x-y=9 \end{cases}$ mult. by -1 to elim. xs

Elimination

$\begin{cases} 3x+10y=-24 \\ -3x+y=-9 \end{cases}$

$11y=-33$

$y=-3$

Find corresp x.

$3x-y=9$

$3x-(-3)=9$

$3x+3=9$

$3x=6$

$x=2$

$(2,-3)$

(e) $\begin{cases} 9x+4y=-3 \\ 6x=-6y-7 \end{cases}$

$\begin{array}{ll} 9x+4y=-3 & \text{mult 3} \\ 6x+6y=-7 & \text{mult(-2)} \end{array}$ $\begin{array}{l} 27x+12y=-9 \\ -12x-12y=14 \end{array}$

Elimination···eliminate ys···get 12y

$\dfrac{15x=5}{}$

$x=\frac{1}{3}$

Find corresp. y
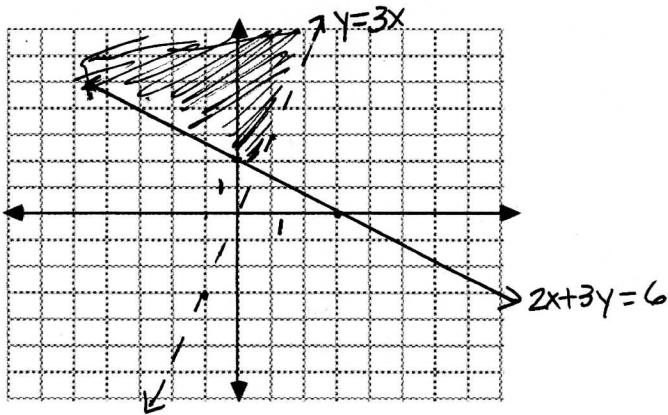
$9x+4y=-3$

$9\left(\frac{1}{3}\right)+4y=-3$
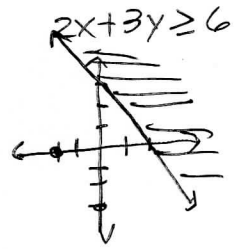
$3+4y=-3$

$4y=-6$

$y=\frac{-6}{4}=\frac{-3}{2}$
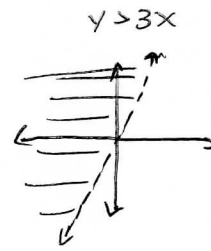
$\left(\frac{1}{3},\frac{-3}{2}\right)$

(3) Graph the solution to the system of inequalities. $\begin{cases} y > 3x \\ 2x + 3y \geq 6 \end{cases}$ (10 points)

Label both llines and make sure your solution is clearly shown.

$y = 3x$

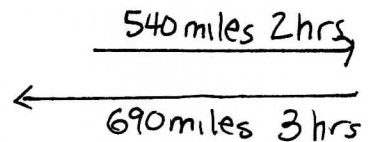$2x + 3y = 6$

$y > 3x$

$2x + 3y \geq 6$

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(4) Set up a SYSTEM of equations with TWO variables and solve. Be sure to show what your variables represent.

A certain plane flying with the wind travels 540 miles in 2 hours. Later, flying against the wind, the plane travels 690 miles in 3 hours. Find the speed of the plane in still air and the speed of the wind. (9 points)

	r	t	d
with wind	p+w	2	$2(p+w) = 540$
against	p−w	3	$3(p−w) = 690$

rate of wind: w

540 miles 2 hrs

690 miles 3 hrs

speed of plane in still air: p

$\begin{cases} 2(p+w) = 540 \\ 3(p−w) = 690 \end{cases}$ divide 2 / divide 3

$\begin{cases} p+w = 270 \\ p−w = 230 \end{cases}$

Eliminate w by adding

↑ don't have to do this way

$2p = 500$ $p = 250$

Find w.

$p + w = 270$

$250 + w = 270$

$w = 20$

plane: 250 mph
wind: 20 mph

(5) Set up a SYSTEM of equations with TWO variables and solve. Be sure to show what your variables represent..
A collection of 19 coins consists of dimes and quarters. How many of each type of coin is there in the collection if the total value is $2.95?

(9 points)

\# dimes: d
\# quarters: q

19 coins $\Rightarrow$ $\begin{cases} d+q=19 \\ 10d+25q=295 \end{cases}$ $\Rightarrow$ $\begin{cases} d=19-q \\ 10d+25q=295 \end{cases}$

$\$2.95$ value $\Rightarrow$

Solve system, shown here is substitution

$$10(19-q)+25q=295$$
$$190-10q+25q=295$$
$$190+15q=295$$
$$15q=105$$
$$q=\frac{105}{15}=7 \text{ quarters}$$
$$d=19-q=19-7=12 \text{ dimes}$$

(6) Find the equation of each of the following lines. Express your answer in slope intercept form.

(5 points each)

(a) The line through (0,2) and parallel to the line 2x-4y=7.

point

Our line parallel to this so has same slope. Find slope here.

point $(0,2)$
$m=\frac{1}{2}$ $\Rightarrow$ Line $y=\frac{1}{2}x+2$

$2x-4y=7$
$-4y=-2x+7$
$y=\frac{-2x}{-4}+\frac{7}{-4}=\frac{1}{2}x-\frac{7}{4}$
$m=\frac{1}{2}$

(b) The line through (2, -5) and (3, 2)

Need point : $(3,2)$ (use either)

slope: $\frac{y_2-y_1}{x_2-x_1}=\frac{2--5}{3-2}=\frac{7}{1}=7$

Eqn $\quad y-y_1=m(x-x_1)$
$y-2=7(x-3)$
$y-2=7x-21$
$y=7x-19$ can check... BOTH points
should be on line