Mat 1340 Casey Knapp

1. Solve in 3 ways $2x+5y=20$, $3x-2y=18$

$\frac{67}{70}$ good job! ☺

a) graphing:

$2x+5y=20$, $-2x \quad -2x$ $\longrightarrow$ $\frac{5y}{5}=\frac{20}{5}-\frac{2x}{5}$ $\rightarrow$ $y=\frac{20}{5}+\frac{-2}{5}$

$3x-2y=18$, $-3x \quad -3x$ $\longrightarrow$ $\frac{-2y}{-2}=\frac{18}{-2}+\frac{-3x}{-2}$ $\rightarrow$ $y=\frac{18}{-2}+\frac{-3x}{-2}$

$\downarrow$

$y=4-\frac{2x}{5}$

$y=-9+\frac{3x}{2}$

$\rightarrow 4-\frac{2x}{5}=-9+\frac{3x}{2}$ $\quad -\frac{3x}{2} \quad -\frac{3x}{2}$

$\downarrow$

$4-\frac{2x}{5}-\frac{3x}{2}=-9$

$\downarrow$

$4-\frac{2x}{5}\cdot\frac{2}{2}-\frac{3x}{2}\cdot\frac{5}{5}=-9 \rightarrow 4-\frac{2x\cdot 2}{5\cdot 2}-\frac{3x\cdot 5}{2\cdot 5}=-9$

$\downarrow$

$4+\frac{x(-2\cdot 2-3\cdot 5)}{10}=-9$ $\quad \leftarrow 4+\frac{-2x\cdot 2-3x\cdot 5}{10}=-9$

$\downarrow$

$4+\frac{x(-4-15)}{10}=-9 \longrightarrow -\frac{4}{4}-\frac{19x}{10}=-9-4$

$\downarrow$

$-\frac{10}{19}\left(\frac{19x}{10}\right)=-\frac{10}{19}\cdot -13 \quad \leftarrow -\frac{19x}{10}=-13$

$\downarrow$

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1. Continued

a)

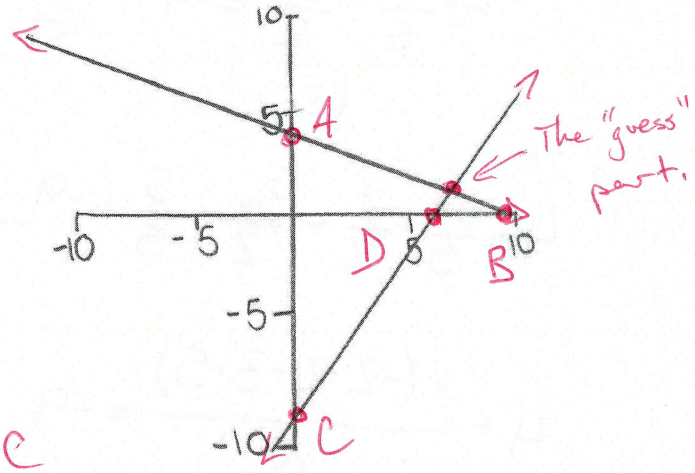
$$x = -\frac{10}{19}\cdot 13 \rightarrow \boxed{x = \frac{130}{19}} \rightarrow y = -9 + \frac{3\left(\frac{130}{19}\right)}{2}$$

$$y = -9 + \frac{\frac{3\cdot 130}{19}}{2} \rightarrow y = -9 + \frac{390}{19}\cdot\frac{1}{2} \rightarrow y = -9 + \frac{2\cdot 195}{19}\cdot\frac{1}{2} \rightarrow y = -9 + \frac{195}{19}$$

$$y = -9\cdot\frac{19}{19} + \frac{195}{19} \rightarrow y = \frac{-9\cdot 19}{19} + \frac{195}{19} \rightarrow y = \frac{-9\cdot 19 + 195}{19}$$

$$\boxed{y = \frac{24}{19}}$$

Points are $\left(\frac{130}{19}, \frac{24}{19}\right)$



(a) $2x + 5y = 20$ $\quad 3x - 2y = 18$

x	y	
0	4	(0,4) A
10	0	(10,0) B

x	y	
0	-9	(0,-9) C
6	0	(6,0) D

Need these points

+7.5

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b) use the substitution method

$2x+5y=20$ $\quad -5y \quad -5y$

$3x-2y=18 \rightarrow$

$2x = 20-5y \rightarrow \frac{2x}{2} = \frac{20}{2} + \frac{-5y}{2}$

$x = \frac{20}{2} + \frac{-5y}{2} \rightarrow x = 10 + \frac{-5y}{2}$

$3x-2y=18 \rightarrow 3(10-\frac{5y}{2})-2y=18$

$3\cdot 10+3\left(-\frac{5y}{2}\right)-2y=18$

$30+3\left(\frac{-5y}{2}\right)-2y=18$

$30-3\frac{5y}{2}-2y=18$

$30+\frac{-3(5y)}{2}-2y=18 \rightarrow 30+\frac{-15y}{2}-2y=18 \rightarrow 30-\frac{15y}{2}-2y=18$

$30-\frac{15y}{2}-2y\cdot\frac{2}{2}=18$

$30-\frac{15y}{2}+\frac{-2y\cdot 2}{2}=18$

$30+\frac{-15y-2y\cdot 2}{2}=18$

$30+\frac{y\cdot -19}{2}=18 \rightarrow 30-\frac{19y}{2}=18 \rightarrow -\frac{19y}{2}=-12$

$-30 \quad -30$

$-\frac{2}{19}\cdot\left(-\frac{19y}{2}\right)=-\frac{2}{19}\cdot -12$

$-\frac{2}{19}\cdot\frac{-19y}{2}=-\frac{2}{19}\cdot -12$

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b) continued

$$\frac{2(-1)}{19}\cdot\frac{-19y}{2}=-\frac{2}{19}\cdot-12 \rightarrow \frac{-1}{19}\cdot(-19y)=-\frac{2}{19}\cdot-12$$

This is not good flow

$$\frac{-1}{19}\cdot(19(-y))=-\frac{2}{19}\cdot-12 \leftarrow y=-\frac{2}{19}\cdot-12 \leftarrow y=12\left(\frac{2}{19}\right)$$

$$y=\frac{12\cdot2}{19} \rightarrow y=\frac{24}{19} \rightarrow x=10-\frac{5\left(\frac{24}{19}\right)}{2}$$

$$x=10-\frac{5y}{2}$$

$$x=10-\left(\frac{120}{19}\cdot\frac{1}{2}\right) \leftarrow x=10-\frac{\frac{120}{19}}{2} \leftarrow x=10-\frac{\frac{5\cdot24}{19}}{2}$$

$$x=10-\left(\frac{2(60)}{19}\cdot\frac{1}{2}\right) \rightarrow x=10-\frac{60}{19} \rightarrow x=10\cdot\frac{19}{19}-\frac{60}{19}$$

$$x=\frac{10\cdot19-60}{19}$$

$$x=\frac{130}{19}$$

$$y=\frac{24}{19}$$

+10

C) Using the elimination method

$(-3)\cdot(2x+5y)=(-3)(20) \rightarrow -6x-15y=-60$

$(2)\cdot(3x-2y)=(2)(18)$

$$\begin{array}{r} -6x-15y=-60 \\ +\ 6x-4y=36 \\ \hline -19y=-24 \end{array}$$

$$\frac{-19y}{-19}=\frac{-24}{-19} \rightarrow y=\frac{24}{19}$$

$$-6x-15\left(\frac{24}{19}\right)=-60 \rightarrow -6x+\frac{-15\cdot 24}{19}=-60$$

$$-6x-\frac{360}{19}=-60 \rightarrow -6x=-60+\frac{360}{19} \rightarrow -6x=-60\frac{19}{19}+\frac{360}{19}$$

$$+\frac{360}{19} \qquad +\frac{360}{19}$$

$$-6x=\frac{-60\cdot 19+360}{19} \rightarrow \frac{-6x}{-6}=-\frac{780}{19}$$

$$\frac{-6}{-6}$$

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C) continued

$$X = -\frac{780}{19} \cdot \frac{1}{-6} \longrightarrow x = \frac{6(-130)}{19} \cdot \frac{1}{-6}$$

$$\downarrow$$

$$X = \frac{-130}{19 \cdot -1} \leftarrow x = \frac{-130}{19} \cdot \frac{1}{-1} \leftarrow x = \frac{6 \cdot -130}{19} \cdot \frac{1}{6 \cdot -1}$$

$$\downarrow$$

$$\boxed{X = \frac{130}{19}} \qquad \boxed{y = \frac{24}{19}}$$

+10

$$2x - 2y + z = -13$$
$$3x - 5y - z = -21$$
$$x - 2z = 7$$

2. Use Elimination

$$2x - 2y + z = -13$$
$$3x - 5y - z = -21$$

$$\longrightarrow$$

$$\begin{array}{r} 2x - 2y + z = -13 \\ +\ 3x - 5y - z = -21 \\ \hline 5x - 7y = -34 \end{array}$$

$$\downarrow$$

$$(-2) \cdot (3x - 5y - z) = (-2)(-21) \leftarrow 3x - 5y - z = -21$$
$$x - 2z = 7 \qquad\qquad x - 2z = 7$$

$$\downarrow$$

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2. continued

$$-2(3x)-2(-5y)-2(-z)=(-2)(-21)$$

$$x-2z=7$$

$$-6x+10y-2z=(-2)(-21)$$

$$-6x+10y+2z=42$$

$$+\quad x\qquad -2z=7$$

$$-5x+10y\qquad =49$$

$$5x-7y=-34$$

$$+\ -5x+10y=49$$

$$\frac{3y}{3}=\frac{15}{3}$$

$$y=5$$

$$5x-7\cdot 5=-34$$

$$5x-35=-34$$

$$5x=-34+35$$

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2. Continued

$5x = -34 + 35$

$\frac{5x}{5} = \frac{1}{5}$

$x = \frac{1}{5}$

$2\left(\frac{1}{5}\right) - 2 \cdot 5 + z = -13$

$\frac{2}{5} - 2 \cdot 5 + z = -13$

$\frac{2}{5} - 10 + z = -13$

$\frac{2}{5} - 10 \cdot \frac{5}{5} + z = -13$

$\frac{2}{5} + \frac{-10 \cdot 5}{5} + z = -13$

$\frac{2 - 10 \cdot 5}{5} + z = -13$

Continued on page 9

2. continued

$$\frac{2-50}{5} + z = -13$$

$$-\frac{48}{5} + z = -13$$

$$-\frac{48}{5} + z = +\frac{48}{5}$$

$$+\frac{48}{5}$$

~~$z = \frac{48}{5}$~~ ?

Can only have one "z =" statement, that's down here.

$$z = -13 \cdot \frac{5}{5} + \frac{48}{5}$$

$$z = \frac{-13 \cdot 5}{5} + \frac{48}{5}$$

$$z = \frac{-13 \cdot 5 + 48}{5}$$

$$z = \frac{-65 + 48}{5}$$

$$z = \frac{-17}{5}$$

$\left(\frac{1}{5}, 5, -\frac{17}{5}\right)$ ✓

+ 10

3. $7x + 17y + 27z = 30$
$2x + 5y + 8z = 8$
$x + 2y + 3z = 6$

a)

$7x + 17y + 27z = 30$
$-17y - 27z \quad -17y - 27z$

$$\frac{7x}{7} = \frac{30}{7} - \frac{17y}{7} - \frac{27z}{7}$$

$$x = \frac{30}{7} - \frac{17y}{7} + \frac{-27z}{7}$$

$$2\left(\frac{30}{7}\right) + 2\left(\frac{-17y}{7}\right) + 2\left(-\frac{27z}{7}\right) + 5y + 8z = 8$$

$$\frac{2 \cdot 30}{7} + 2\left(-\frac{17y}{7}\right) + 2\left(-\frac{27z}{7}\right) + 5y + 8z = 8$$

$$\frac{60}{7} + 2\left(-\frac{17y}{7}\right) + 2\left(-\frac{27z}{7}\right) + 5y + 8z = 8$$

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3. continued

a) $\frac{60}{7} - 2\frac{17y}{7} + 2\left(-\frac{27z}{7}\right) + 5y + 8z = 8$

$\frac{60}{7} + \frac{-34y}{7} - 2\left(\frac{27z}{7}\right) + 5y + 8z = 8$

$\frac{60}{7} + \frac{-34y}{7} + \frac{-54z}{7} + 5y + 8z = 8$

$\frac{60}{7} - \frac{34y}{7} - \frac{54z}{7} + 5y + 8z = 8$

$\frac{60}{7} - \frac{34y}{7} - \frac{54z}{7} + 5y \cdot \frac{7}{7} + 8z = 8$

$\frac{60}{7} - \frac{34y}{7} - \frac{54z}{7} + \frac{5y \cdot 7}{7} + 8z = 8$

$8z + \frac{60 - 54z - 34y + 5y \cdot 7}{7} = 8$

$8z + \frac{60 - 54z - 34y + 35y}{7} = 8$

3. Continued

$$8z + \frac{60 - 54z + y}{7} = 8$$

$$8z \cdot \frac{7}{7} + \frac{60 - 54z + y}{7} = 8$$

$$\frac{8z \cdot 7}{7} + \frac{60 - 54z + y}{7} = 8$$

$$\frac{56z + 60 - 54z + y}{7} = 8$$

$$\frac{2z + 60 + y}{7} = 8$$

$$\frac{2z + 60 + y}{7} \cdot 7 = 8 \cdot 7$$

$$y + 2z + 60 = 56$$

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3. continued

a)

$$y + 2z + 60 = 56$$
$$-2z - 60 \quad -2z - 60$$

$$y = 56 - 2z - 60$$

$$\boxed{y = -2z - 4}$$

$$x = \frac{30}{7} - \frac{17y}{7} - \frac{27x}{7}$$

$$x = \frac{30 - 17(-2z - 4) - 27z}{7}$$

$$x = \frac{30 - 17(-2z) - 17 \cdot -4 - 27z}{7}$$

$$x = \frac{30 + 34z - 17 \cdot -4 - 27z}{7}$$

$$x = \frac{30 + 34z + 68 - 27z}{7}$$

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3. continued

a)

$$x = \frac{34z + 98 - 27z}{7}$$

$$x = \frac{7z + 98}{7}$$

Factor

$$x = \frac{\cancel{7}(z + 14)}{\cancel{7}(1)}$$

$$x = \frac{z + 14}{1}$$

$x = z + 14$

$y = -2z - 4$

~~$x + 2y + 3z = 6$~~

z is free

+9.5

Mat 1340

3. continued

b)

Corresponding with $z=0$:

$x = 14$ ✓

$y = -4$ ✓

then say $(x, y, z) = (14, -4, 0)$

$x + 2y + 3z = 6$

Corresponding with $z=1$:

$x = 15$ ✓

$y = -6$ ✓

$x + 2y + 3z = 6$

Corresponding with $z=-1$:

$x = 13$ ✓

$y = -2$ ✓

$x + 2y + 3z = 6$

+10

4. Show it has no solution

$7x+17y+27z=30$

$2x+5y+8z=3$

$x+2y+3z=6$

$x+2y+3z=6$

$-2y \qquad -2y$

$x+3z=6-2y$

$-3z \qquad -3z$

$\boxed{x=6-2y-3z}$

$7(6-2y-3z)+17y+27z=30$

$7\cdot 6+7(-2y)+7(-3z)+17y+27z=30$

$42+7(-2y)+7(-3z)+17y+27z=30$

$42-14y-21z+17y+27z=30$

$42+3y+6z=30$

4. continued

$$2(6-2y-3z)+5y+8z=3$$

$$2\cdot 6+2(-2y)+2(-3z)+5y+8z=3$$

$$12+2(-2y)+2(-3z)+5y+8z=3$$

$$12-4y-6z+5y+8z=3$$

$$12+y-6z+8z=3$$

$$\begin{array}{llll} 12+y+2z=3 & & & \\ -12 & -2z & -12 & -2z \end{array}$$

$$y=3-12-2z$$

$$\boxed{y=-9-2z}$$

$$42+3(-9-2z)+6z=30$$

$$42+3\cdot -9+3(-2z)+6z=30$$

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4. continued

$42-27+3(-2z)+6z=30$

$42-27-6z+6z=30$

$42-27=30$

$\boxed{15=30}$ ✓

$x=6-2(-9-2z)-3z$

$x=6-2\cdot-9-2(-2z)-3z$

$x=6+18-2(-2z)-3z$

$x=6+18+4z-3z$

$\boxed{\begin{array}{l} x=24+z \\ 15=30 \\ y=-9-2x \end{array}}$

good!

No solution

+10