

**Unit 3 IN CLASS REVIEW!**

- 1) Solve the following system of equations algebraically.
- $$\begin{aligned} 5x - 4y + 2z &= 21 \\ -x - 5y + 6z &= -24 \\ -x - 4y + 5z &= -21 \end{aligned}$$

2) Consider  $f(x) = \begin{cases} -4x - 8 & x \leq -3 \\ x^2 + 6x + 5 & x > -3 \end{cases}$

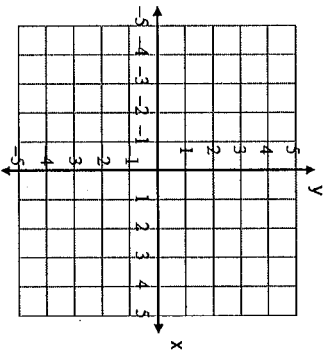
- a. Find the y-intercept algebraically.  
Justify your answer.
- b. Algebraically, find the x-intercept(s).  
Are they all valid answers?

- c. Find  $f(-5)$ .  
d. Find  $f(2)$ .  
e. Find  $f(f(-4))$ .

- 3) a) Graph the piecewise function given below.

$$f(x) = \begin{cases} 2x + 2 & x < 1 \\ x^2 - 4x & x \geq 1 \end{cases}$$

- b) State the range of  $f(x)$  in interval notation.



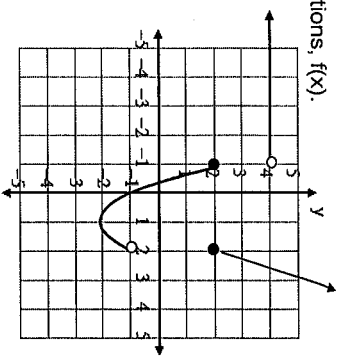
- c) Describe the end behavior.

- d) State the y-intercept.  
e) State the x-intercept(s).

f) Evaluate:  $f(-2) =$  \_\_\_\_\_

$f(3) =$  \_\_\_\_\_

- 4) a) Write the equations of the following piecewise functions,  $f(x)$ .



- b) State the range in interval notation.  
c) Is  $f(x)$  a function? Explain.

- d) State the y-intercept of  $f(x)$ .  
e) Write in interval notation where the  $f(x)$  is increasing.

- f) Find  $f(x) = 2$  algebraically.  
Justify your answer.  
g) Describe the end behavior.

- 5) Given the function  $f(x) = x^2 - 2x + 7$ , what is the average rate of change over the interval  $3 \leq x \leq 11$ .

- 6 - 7 : Find the  $f^{-1}(x)$  (inverse) for the following functions.

6)  $f(x) = \frac{5x-7}{3x+2}$

7)  $f(x) = 2(x-1)^2 + 4$

**Unit 3 IN CLASS REVIEW!**

$(5, -1, -4)$

1) Solve the following system of equations algebraically.

$$\begin{aligned} 5x - 4y + 2z &= 21 \\ 5(-x - 5y + 6z) &= -21 \\ 5x - 4y + 2z &= 21 \\ -5x - 25y + 30z &= -21 \\ -29y + 32z &= -42 \end{aligned}$$

$5x - 4y + 2z = 21$   
 $-x - 5y + 6z = -21$   
 $-x - 4y + 5z = -21$

$-29y + 32z = -42$   
 $11y - 12z = 3$

$32z = -12$   
 $z = -\frac{3}{8}$

$11y - 12(-\frac{3}{8}) = 3$   
 $11y + \frac{9}{2} = 3$   
 $11y = 3 - \frac{9}{2} = \frac{6}{2} - \frac{9}{2} = -\frac{3}{2}$   
 $y = -\frac{3}{22}$

$5x - 4(-\frac{3}{22}) + 2(-\frac{3}{8}) = 21$   
 $5x + \frac{6}{11} - \frac{3}{4} = 21$   
 $5x = 21 - \frac{6}{11} + \frac{3}{4} = \frac{924}{110} - \frac{60}{110} + \frac{75}{110} = \frac{939}{110}$   
 $x = \frac{939}{550}$

2) Consider  $f(x) = \begin{cases} -4x - 8 & x \leq -3 \\ x^2 + 6x + 5 & x > -3 \end{cases}$

a. Find the y-intercept algebraically.

Justify your answer:  $X = 0$

$y = (0)^2 + 6(0) + 5 = 5$

$y = 5$  or  $(0, 5)$

b. Algebraically, find the x-intercept(s).

Are they all valid answers?  $y = 0$

$0 = -4x - 8$   
 $4x = -8$   
 $x = -2$

$0 = x^2 + 6x + 5$   
 $0 = (x+5)(x+1)$   
 $x = -5$  or  $x = -1$

c. Find  $f(-5)$ .

$-4(-5) - 8 = 12$

d. Find  $f(2)$ .

$(2)^2 + 6(2) + 5 = 21$

e. Find  $f(4)$ .

$4^2 + 6(4) + 5 = 17$

3) a) Graph the piecewise function given below.

$f(x) = \begin{cases} 2x + 2 & x < 1 \\ x^2 - 4x & x \geq 1 \end{cases}$

b) State the range of  $f(x)$  in interval notation.

$(-\infty, \infty)$

c) Describe the end behavior.

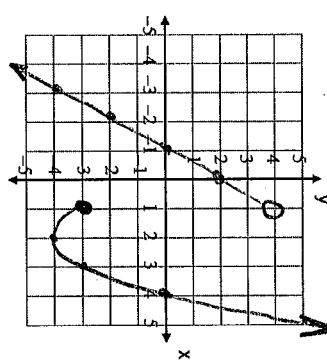
$x \rightarrow -\infty, f(x) \rightarrow -\infty$   
 $x \rightarrow +\infty, f(x) \rightarrow +\infty$

d) State the y-intercept.

$y = 2$  or  $(0, 2)$

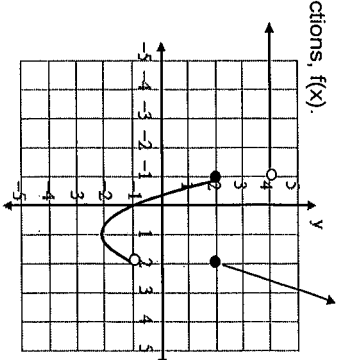
e) State the x-intercept(s).

$x = -1, 4$



4) a) Write the equations of the following piecewise functions,  $f(x)$ .

$f(x) = \begin{cases} 4, & x < -1 \\ (x-1)^2 - 2, & -1 \leq x < 2 \\ 3x - 4, & x \geq 2 \end{cases}$



State the range in interval notation.

$[-2, \infty)$

State the y-intercept of  $f(x)$ .

$y = -1$  or  $(0, -1)$

Write in interval notation where the  $f(x)$  is increasing.

$(1, 2) \cup (2, \infty)$

Find  $f(x) = 2$  algebraically. Justify your answer.

$2 = 2$   
 $2 = (x-1)^2 - 2$   
 $4 = (x-1)^2$   
 $2 = x-1$   
 $x = 3$   
 $2 = 3x - 4$   
 $6 = 3x$   
 $2 = x$

Describe the end behavior.

$x \rightarrow -\infty, f(x) \rightarrow 4$   
 $x \rightarrow +\infty, f(x) \rightarrow +\infty$

5) Given the function  $f(x) = x^2 - 2x + 7$ , what is the average rate of change over the interval  $3 \leq x \leq 11$ .

$(3, 10)$   
 $m = \frac{106 - 10}{8} = \frac{96}{8} = 12$

6-7: Find the  $f^{-1}(x)$  (inverse) for the following functions.

6)  $f(x) = \frac{5x-7}{3x+2}$

$y = \frac{5x-7}{3x+2}$   
 $3xy + 2y = 5x - 7$   
 $3xy - 5x = -2y - 7$   
 $x(3y - 5) = -2y - 7$   
 $x = \frac{-2y - 7}{3y - 5}$

7)  $f(x) = 2(x-1)^2 + 4$

$y = 2(x-1)^2 + 4$   
 $y - 4 = 2(x-1)^2$   
 $\frac{y-4}{2} = (x-1)^2$   
 $\pm \sqrt{\frac{y-4}{2}} = x-1$   
 $1 \pm \sqrt{\frac{y-4}{2}} = x$

Name: \_\_\_\_\_  
 Review Unit 3

Date: \_\_\_\_\_  
 WS #40

Calc. # \_\_\_\_\_  
 Period: \_\_\_\_\_

1-6: Solve the following systems of equations algebraically.

- 1)  $-4x - 5y - z = 18$   
 $-2x + 5y + 2z = 4$   
 $-2x - 5y - 2z = 12$
- 2)  $2x + 5y - 3z = -10$   
 $-x - 5y + z = 17$   
 $-5x - 5y + 5z = 5$

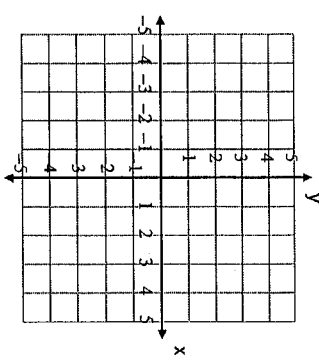
- 3)  $4x + 4y + z = 24$   
 $2x - 4y + z = 0$   
 $5x - 4y - 5z = 12$
- 4)  $4x - 4y + 4z = -4$   
 $4x + y - 2z = 5$   
 $-3x - 3y - 4z = -16$

- 5)  $x - 6y + 4z = -12$   
 $x + y - 4z = 12$   
 $2x + 2y + 5z = -15$
- 6)  $x + 3y + 5z = 45$   
 $6x - 3y + 2z = -10$   
 $-2x + 3y + 8z = 72$

7-9: Graph the following piecewise functions.

7)  $f(x) = \begin{cases} 2x+4, & x \leq -1 \\ -x+2, & -1 < x \leq 3 \\ -4, & 3 < x \leq 5 \end{cases}$

- a) Write the range of the function in interval notation.
- b) Describe the end behavior.



- c) State the y-intercept.

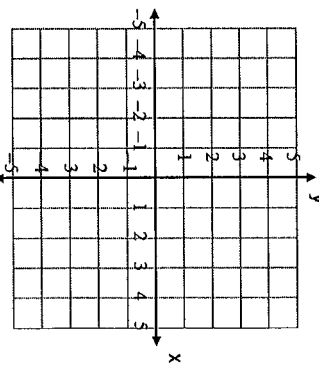
- d) State the x-intercepts.

8)  $f(x) = \begin{cases} -x, & x \leq -3 \\ x^2 - 4, & -3 < x \leq 2 \\ \sqrt{x-2}, & x > 2 \end{cases}$

- a) Write the range of the function in interval notation.

- b) Describe the end behavior.

- d) Find  $f(x) = -3$ .



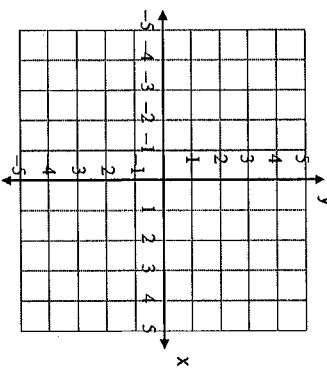
9)  $f(x) = \begin{cases} x^2 + 1, & x \leq 0 \\ 2x - 1, & 0 < x \leq 2 \\ 4, & x > 2 \end{cases}$

- a) Write the range of the function in interval notation.

- b) Describe the end behavior.

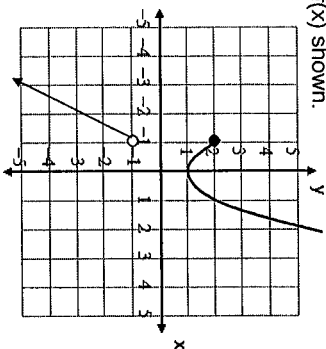
- c) State the y-intercept.

- d) Find  $f(x) = 1$ .



- e) Evaluate:  $f(-2) =$  \_\_\_\_\_  $f(3) =$  \_\_\_\_\_  $f(f(0)) =$  \_\_\_\_\_

10) a) Write the piecewise equation(s) for the function  $f(x)$  shown.



b) State the range in interval notation.

c) Is  $f(x)$  a function? Explain.

d) State the y-intercept of  $f(x)$ .

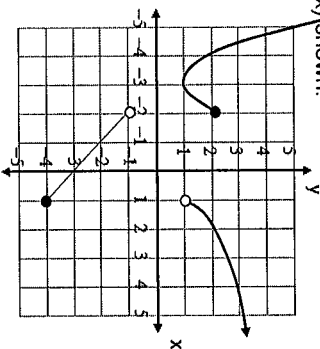
e) State in interval notation where

f) State in interval notation where

$f(x)$  is decreasing.

$f(x)$  is increasing.

11) a) Write the piecewise equation(s) for the function  $f(x)$  shown.



b) State the range in interval notation.

c) Is  $f(x)$  a function? Explain.

d) State the y-intercept of  $f(x)$ .

e) Find  $f(x) = 2$ .

f) State in interval notation where

g) State in interval notation where

$f(x)$  is decreasing.

$f(x)$  is increasing.

12) For the piecewise function  $g(x) = \begin{cases} x^2 - 5x + 2, & x < 1 \\ 2x - 4, & x \geq 1 \end{cases}$  answer the following questions.

a) Determine the y-intercept of this function algebraically. Explain.

b) Determine the x-intercept(s) of this function algebraically. Explain.

c) Find  $g(x) = -2$  algebraically.

13) Find the average rate of change over the interval  $-1 \leq x \leq 6$ , for the following functions:

a)  $f(x) = 7x + 1$

b)  $g(x) = x^3 - 4$

c)  $h(x) = 4^x$

14 - 17: Find the  $f^{-1}(x)$  (inverse) for the following functions:

14)  $f(x) = 2x + 6$

15)  $f(x) = 4x^2 - 2$

16)  $f(x) = \sqrt{5x - 3}$

17)  $f(x) = \frac{2x - 5}{x - 7}$

1-6: Solve the following systems of equations algebraically.

- 1)  $-4x - 5y - z = 18$   
 $-2x + 5y + 2z = 4$   
 $-2x - 5y - 2z = 12$
- 2)  $2x + 5y - 3z = -10$   
 $-x - 5y + z = 17$   
 $-5x - 5y + 5z = 5$

$(-4, 0, 2)$   
 $(-1, -4, -4)$

these answers on separate sheet

- 3)  $4x + 4y + z = 24$   
 $2x - 4y + z = 0$   
 $5x - 4y - 5z = 12$
- 4)  $4x - 4y + 4z = -4$   
 $4x + y - 2z = 5$   
 $-3x - 3y - 4z = -16$

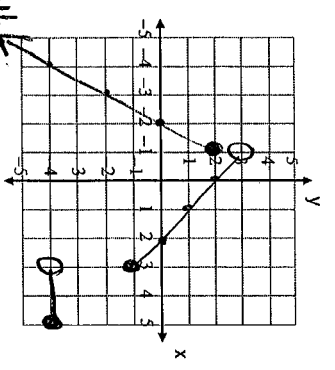
$(4, 2, 0)$   
 $(1, 3, 1)$

- 5)  $x - 6y + 4z = -12$   
 $x + y - 4z = 12$   
 $2x + 2y + 5z = -15$
- 6)  $x + 3y + 5z = 45$   
 $6x - 3y + 2z = -10$   
 $-2x + 3y + 8z = 72$

$(0, 0, -3)$   
 $(-2, 4, 7)$

7-9: Graph the following piecewise functions.

7)  $f(x) = \begin{cases} 2x+4, & x \leq -1 \\ -x+2, & -1 < x \leq 3 \\ -4, & 3 < x \leq 5 \end{cases}$



a) Write the range of the function in interval notation.  
 $(-\infty, 3)$

b) Describe the end behavior.  
 $X \rightarrow -\infty, f(x) \rightarrow -\infty$   
 $X \rightarrow +\infty, f(x) \rightarrow -4$

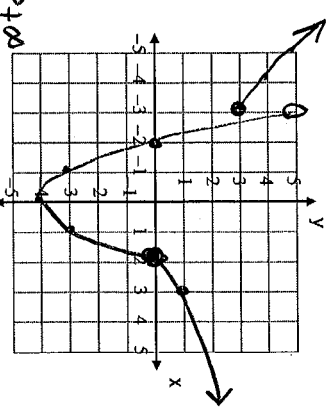
c) State the y-intercept.  
 $y = 2.0$  or  $(0, 2)$

8)  $f(x) = \begin{cases} -x, & x \leq -3 \\ x^2 - 4, & -3 < x \leq 2 \\ \sqrt{x-2}, & x > 2 \end{cases}$

a) Write the range of the function in interval notation.  
 $[-4, \infty)$

b) Describe the end behavior.  
 $X \rightarrow -\infty, f(x) \rightarrow +\infty$   
 $X \rightarrow +\infty, f(x) \rightarrow +\infty$

c) State the y-intercept.  
 $y = -4$  or  $(0, -4)$



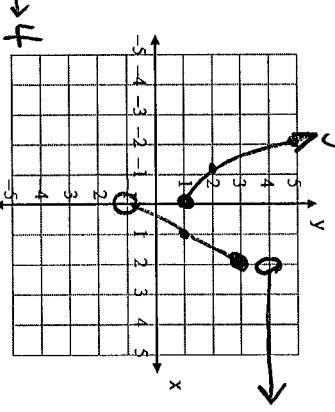
d) Find  $f(x) = -3$ .  $X = -1, 1$

9)  $f(x) = \begin{cases} x^2 + 1, & x \leq 0 \\ 2x - 1, & 0 < x \leq 2 \\ 4, & x > 2 \end{cases}$

a) Write the range of the function in interval notation.  
 $(-1, \infty)$

b) Describe the end behavior.  
 $X \rightarrow -\infty, f(x) \rightarrow +\infty$   
 $X \rightarrow +\infty, f(x) \rightarrow 4$

c) State the y-intercept.  
 $y = 1$  or  $(0, 1)$



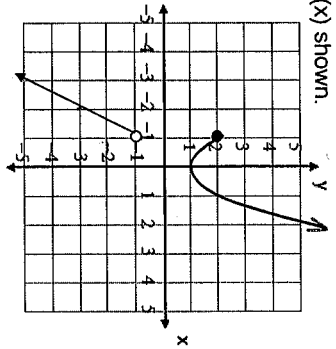
d) Find  $f(x) = 1$ .  $X = 0, 1$

e) Evaluate:  $f(-2) = 5$ ,  $f(3) = 4$

$f(f(0)) = 1$   
 $f(1) = 1$

10) a) Write the piecewise equation(s) for the function  $f(x)$  shown.

$$f(x) = \begin{cases} -2x + 1, & x < -1 \\ x^2 + 1, & x \geq -1 \end{cases}$$



b) State the range in interval notation.

$$(-\infty, -1) \cup [1, \infty)$$

c) Is  $f(x)$  a function? Explain.

YES, PASSES VLT

e) State in interval notation where  $f(x)$  is decreasing.

$$(-1, 0)$$

f) State in interval notation where  $f(x)$  is increasing.

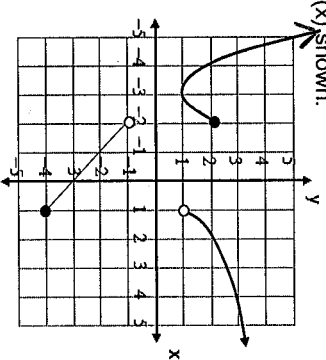
$$(-\infty, -1) \cup (0, \infty)$$

d) State the y-intercept of  $f(x)$ .

$$y = 1 \text{ or } (0, 1)$$

11) a) Write the piecewise equation(s) for the function  $f(x)$  shown.

$$f(x) = \begin{cases} (x+3)^2 + 1, & x \leq -3 \\ -x - 3, & -2 < x \leq 1 \\ \sqrt{x-1} + 1, & x > 1 \end{cases}$$



b) State the range in interval notation.

$$[-4, -1) \cup [1, \infty)$$

c) Is  $f(x)$  a function? Explain.

YES, PASSES VLT

d) State the y-intercept of  $f(x)$ .

$$y = -3 \text{ or } (0, -3)$$

e) Find  $f(x) = 2$ .

$$x = -1 \text{ or } 2$$

f) State in interval notation where  $f(x)$  is decreasing.

$$(-\infty, -3) \cup (-1, 1)$$

g) State in interval notation where  $f(x)$  is increasing.

$$(-3, -2) \cup (1, \infty)$$

12) For the piecewise function  $g(x) = \begin{cases} x^2 - 5x + 2, & x < 1 \\ 2x - 4, & x \geq 1 \end{cases}$  answer the following questions.

a) Determine the y-intercept of this function algebraically. Explain.  $x = 0$

$$y = (0)^2 - 5(0) + 2$$

$$y = 2 \text{ or } (0, 2)$$

b) Determine the x-intercept(s) of this function algebraically. Explain.  $y = 0$

$$0 = x^2 - 5x + 2$$

$$x = 5 \pm \sqrt{(-5)^2 - 4(1)(2)}$$

$$x = 5 \pm \sqrt{25 - 8}$$

$$x = 5 \pm \sqrt{17}$$

$$x = 5 + \sqrt{17} \text{ or } x = 5 - \sqrt{17}$$

$$\boxed{x = 5 + \sqrt{17} \text{ or } x = 5 - \sqrt{17}}$$

13) Find the average rate of change over the interval,  $-1 \leq x \leq 6$ , for the following functions:

a)  $f(x) = 7x + 1$   
 $(-1, -6)$   
 $(6, 43)$

$$m = \frac{43 + 6}{6 + 1} = \frac{49}{7} = 7$$

b)  $g(x) = x^3 - 4$   
 $(-1, -5)$   
 $(6, 216)$

$$m = \frac{216 + 5}{6 + 1} = \frac{221}{7} = 31$$

c)  $h(x) = 4^x$   
 $(-1, 0.25)$   
 $(6, 4096)$

$$m = \frac{4096 - 0.25}{6 + 1} = \frac{4095.75}{7} = \frac{16383}{28}$$

14 - 17: Find the  $f^{-1}(x)$  (inverse) for the following functions:

14)  $f(x) = 2x + 6$

$$x = \frac{y - 6}{2}$$

$$\boxed{\frac{x}{2} - 3 = y}$$

15)  $f(x) = 4x^2 - 2$

$$x = \frac{\sqrt{y + 2}}{2}$$

$$\boxed{\pm \sqrt{\frac{y + 2}{4}} = y}$$

16)  $f(x) = \sqrt{5x - 3}$

$$(x)^2 = (5y - 3)$$

$$x^2 + 3 = 5y$$

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

$$\boxed{\frac{x^2 + 3}{5} = y}$$

17)  $f(x) = \frac{2x - 5}{x - 2}$

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

$$x(y - 2) = 2y - 5$$

$$xy - 2x = 2y - 5$$

$$xy - 2y = 2x - 5$$

$$y(x - 2) = 2x - 5$$

$$\frac{y(x - 2)}{x - 2} = \frac{2x - 5}{x - 2}$$

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

$$\begin{array}{r}
 1. -1(-4x-5y-z=18) \quad 4x+5y+z=-18 \\
 -2x-5y-2z=12 \quad -2x-5y-2z=12 \\
 \hline
 2x-12=-6 \\
 2(-4)-12=-6 \\
 -8-12=-6 \\
 +8 \quad +8 \\
 \hline
 -12=2 \\
 -1 \quad -1 \\
 \hline
 \boxed{z=-2} \\
 \\
 -4x=10 \\
 \frac{-4}{-4} \quad \frac{-4}{-4} \\
 \boxed{x=-4}
 \end{array}$$

$$\begin{array}{r}
 -4(-4)-5y+z=18 \\
 16-5y+z=18 \\
 -5y+z=2 \\
 -5y+z=2 \\
 \hline
 -5y=0 \\
 \frac{-5}{-5} \quad \frac{0}{-5} \\
 \boxed{y=0}
 \end{array}$$

$$\begin{array}{r}
 2. -x-5y+z=17 \quad -x-5y+z=17 \\
 -1(-5x-5y+5z=5) \quad 5x+5y-5z=-5 \\
 \hline
 4x-4z=12 \\
 4x-4z=12 \\
 4x-4z=12 \\
 \hline
 -5x-5y+5z=5 \\
 2x+5y-3z=-10 \\
 \hline
 -3x+2z=-5 \\
 2(-3x+2z=-5) \quad -6x+4z=-10 \\
 \hline
 -3(-1)+2z=-5 \\
 3+2z=-5 \\
 -3 \quad -3 \\
 \hline
 2z=-8 \\
 \frac{2z}{2} \quad \frac{-8}{2} \\
 \boxed{z=-4} \\
 \\
 -2x=2 \\
 \frac{-2}{-2} \quad \frac{2}{-2} \\
 \boxed{x=-1}
 \end{array}$$

$$\begin{array}{r}
 1-5y-4=17 \\
 -5y-3=17 \\
 +3 \quad +3 \\
 \hline
 -5y=20 \\
 \frac{-5y}{-5} \quad \frac{20}{-5} \\
 \boxed{y=-4}
 \end{array}$$

$$\begin{array}{r}
 3. 4x+4y+z=24 \\
 2x-4y+z=0 \\
 \hline
 6x+2z=24
 \end{array}$$

$$\begin{array}{r}
 2x-4y+z=0 \quad 2x-4y+z=0 \\
 -1(5x-4y-5z=12) \quad -5x+4y+5z=-12 \\
 \hline
 -3x+6z=-12
 \end{array}$$

$$\begin{array}{r}
 6x+2z=24 \quad 6x+2z=24 \\
 2(-3x+6z=-12) \quad -6x+12z=-24 \\
 \hline
 14z=0 \\
 \frac{14z}{14} \quad \frac{0}{14} \\
 \boxed{z=0} \\
 \\
 6x+2(0)=24 \\
 \frac{6x}{6} \quad \frac{24}{6} \\
 \boxed{x=4}
 \end{array}$$

$$\begin{array}{r}
 4(4)+4y+0=24 \\
 4y+16=24 \\
 -16 \quad -16 \\
 \hline
 4y=8 \\
 \frac{4y}{4} \quad \frac{8}{4} \\
 \boxed{y=2}
 \end{array}$$

$$\begin{array}{r}
 4. 4r-4s+4t=-4 \quad 4r-4s+4t=-4 \\
 -1(4r+s-2t=5) \quad -4r-s+2t=-5 \\
 \hline
 -5s+6t=-9
 \end{array}$$

$$\begin{array}{r}
 3(4r+s-2t=5) \quad 12r+3s-6t=15 \\
 4(-3r-3s-4t=-16) \quad -12r-12s-16t=-64 \\
 \hline
 -9s-22t=-49
 \end{array}$$

$$\begin{array}{r}
 9(-5s+6t=-9) \quad -45s+54t=-81 \\
 -5(-9s-22t=-49) \quad 45s+110t=245 \\
 \hline
 104t=164 \\
 \frac{104t}{104} \quad \frac{164}{104} \\
 \boxed{t=1}
 \end{array}$$

$$\begin{array}{r}
 -5s+6(1)=-9 \\
 -5s+6=-9 \\
 -6 \quad -6 \\
 \hline
 -5s=-15 \\
 \frac{-5s}{-5} \quad \frac{-15}{-5} \\
 \boxed{s=3} \\
 \\
 4r-4(3)+4(1)=-4 \\
 4r-12+4=-4 \\
 4r-8=-4 \\
 +8 \quad +8 \\
 \hline
 4r=4 \\
 \frac{4r}{4} \quad \frac{4}{4} \\
 \boxed{r=1}
 \end{array}$$

$$5. \begin{array}{l} X - 6Y + 4Z = -12 \\ X - 6Y + 4Z = -12 \\ -1(X + Y - 4Z = 12) \\ \hline -X - Y + 4Z = -12 \\ \hline -7Y + 8Z = -24 \end{array}$$

$$\begin{array}{l} 2(X + Y - 4Z = 12) \\ 2X + 2Y - 8Z = 24 \\ 2X + 2Y + 5Z = -15 \\ \hline -2X - 2Y + 8Z = -24 \\ \hline 2X + 2Y + 5Z = -15 \\ \hline 13Z = -39 \end{array}$$

$$\begin{array}{l} -7Y + 8(-3) = -24 \\ -7Y - 24 = -24 \\ +24 \quad +24 \\ \hline -7Y = 0 \\ \hline -7 \quad -7 \\ \hline Y = 0 \end{array}$$

$$\begin{array}{l} 13Z = -39 \\ \hline 13 \quad 13 \\ \hline Z = -3 \end{array}$$

$$\begin{array}{l} X - 6(0) + 4(-3) = -12 \\ X - 0 - 12 = -12 \\ X - 12 = -12 \\ +12 \quad +12 \\ \hline X = 0 \end{array}$$

$$6. \begin{array}{l} X + 3Y + 5Z = 45 \\ 6X - 3Y + 2Z = -10 \\ \hline 6X - 3Y + 2Z = -10 \\ -2X + 3Y + 8Z = 72 \\ \hline 7X + 7Z = 35 \\ 6X - 3Y + 2Z = -10 \\ \hline 28X + 28Z = 140 \\ -7(4X + 10Z = 62) \\ \hline -28X - 70Z = -434 \\ \hline -42Z = -294 \\ \hline -42 \quad -42 \\ \hline Z = 7 \end{array}$$

$$\begin{array}{l} 7X + 7(7) = 35 \\ 7X + 49 = 35 \\ -49 \quad -49 \\ \hline 7X = -14 \\ \hline 7 \quad 7 \\ \hline X = -2 \end{array}$$

$$\begin{array}{l} -2 + 3Y + 5(7) = 45 \\ -2 + 3Y + 35 = 45 \\ 3Y + 33 = 45 \\ -33 \quad -33 \\ \hline 3Y = 12 \\ \hline 3 \quad 3 \\ \hline Y = 4 \end{array}$$