1. Solve using substitution: $\begin{array}{l} x^2 + y^2 = 34 \\ x - y = 2 \end{array}$

$x - y = 2$

$x - 2 = y$

then plug into other equation:

$x^2 + y^2 = 34$

$x^2 + (x-2)^2 = 34$

$x^2 + (x-2)(x-2) = 34$

$x^2 + x^2 - 2x - 2x + 4 - 34 = 0$

$2x^2 - 4x - 30 = 0$

$2(x^2 - 2x - 15) = 0$

$2(x-5)(x+3) = 0$

$x - 5 = 0 \quad x + 3 = 0$

$x = 5 \qquad x = -3$

now plug this into the equation from step 1:

$x = 5 \qquad x = -3$

$y = x - 2 \quad y = x - 2$

$y = 5 - 2 \quad y = -3 - 2$

$y = 3 \qquad y = -5$

$(5,3) \qquad (-3,-5)$

2. Solve using Addition (Elimination): $\begin{aligned}x^2 + y^2 &= 5 \\ 2x^2 - 3y^2 &= -10\end{aligned}$

$x^2 + y^2 = 5$

$2x^2 - 3y^2 = -10$

becomes

$3x^2 + 3y^2 = 15$

$2x^2 - 3y^2 = -10$

add these

$5x^2 = 5$

$x^2 = 1$

$x = \pm\sqrt{1}$

$x = \pm 1$

then

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

3. Solve the following system of equations: $\begin{aligned}5w - 3x + 2y - z &= 4 \\ w + 4x - 3y - 5z &= -2 \\ 4w - x - y - z &= 12 \\ 7w + 3x - 2y + z &= -8\end{aligned}$

RREF

$\left(\dfrac{-1}{3}, \dfrac{-569}{93}, \dfrac{-617}{93}, \dfrac{-18}{31} \right)$

$$5a - 2b + 3c - d + e = 2$$
$$9a + 3b - c - d + 5e = 3$$
4. Solve the following system of equations: $a - b - c + 10d - 2e = -4$
$$7a + 2b - c - d + 4e = -8$$
$$3a + 2b - c - d + 5e = -2$$

RREF:

$$\left(\frac{-550}{273}, \frac{1555}{91}, \frac{4651}{273}, \frac{255}{91}, \frac{-562}{273} \right)$$

$$2x + 3y - z = 4$$
5. Solve the following system of equations: $5x - 4y - 2z = 1$
$$4x + 6y - 2z = 8$$

$$\begin{bmatrix} 1 & 0 & \dfrac{-10}{23} & \dfrac{19}{23} \\ 0 & 1 & \dfrac{-1}{23} & \dfrac{18}{23} \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$x - \frac{10}{23}z = \frac{19}{23} \quad y - \frac{1}{23}z = \frac{18}{23}$$
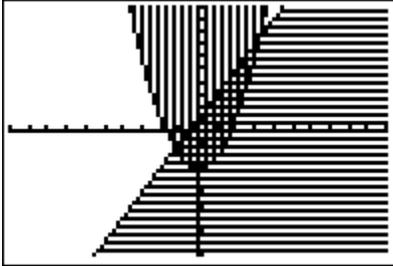
$$x = \frac{10}{23}z + \frac{19}{23} \quad y = \frac{1}{23}z + \frac{18}{23}$$

$$\left(\frac{10}{23}z + \frac{19}{23}, \frac{1}{23}z + \frac{18}{23}, z \right)$$

$$\left(\frac{10}{23}t + \frac{19}{23}, \frac{1}{23}t + \frac{18}{23}, t \right)$$

6. Solve the following system of inequalities: $\begin{aligned} y &> x^2 - 3 \\ y &< 2x + 1 \end{aligned}$

answer is where they are both shaded and the lines surrounding them are dotted lines

Given the following three matrices:

$$A = \begin{bmatrix} 3 & -2 & 1 \\ 4 & -5 & 7 \\ 2 & -3 & 4 \end{bmatrix}, B = \begin{bmatrix} 8 & 2 & -1 \\ 3 & -4 & 7 \\ -6 & 2 & 1 \end{bmatrix}, C = \begin{bmatrix} 10 & -1 & 2 \\ 3 & -5 & -9 \\ 1 & 4 & 2 \end{bmatrix}$$

7. Find:

a) A+B: $\begin{bmatrix} 11 & 0 & 0 \\ 7 & -9 & 14 \\ -4 & -1 & 5 \end{bmatrix}$

b) A-B: $\begin{bmatrix} -5 & -4 & 2 \\ 1 & -1 & 0 \\ 8 & -5 & 3 \end{bmatrix}$

c) -7A: $\begin{bmatrix} -21 & 14 & -7 \\ -28 & 35 & -49 \\ -14 & 21 & -28 \end{bmatrix}$

d) 10A-2B: $\begin{bmatrix} 14 & -24 & 12 \\ 34 & -42 & 56 \\ 32 & -34 & 38 \end{bmatrix}$

8. Find:

    a) $|B|$: 5

    b) C^{-1}: $\begin{bmatrix} 26/309 & 10/309 & 19/309 \\ -5/103 & 6/103 & 32/103 \\ 17/309 & -41/309 & -47/309 \end{bmatrix}$

9. Perform the following row operations:

    a) $3R_1 + R_2$ on A

$$A = \begin{bmatrix} 3 & -2 & 1 \\ 13 & -11 & 10 \\ 2 & -3 & 4 \end{bmatrix}$$

    b) $-2R_2 + R_3$ on C

$$C = \begin{bmatrix} 10 & -1 & 2 \\ 3 & -5 & -9 \\ -5 & 14 & 20 \end{bmatrix}$$

10. Find the determinant (by hand) of: $\begin{vmatrix} 5 & -1 & 3 \\ -2 & 1 & 7 \\ 2 & -6 & 2 \end{vmatrix}$

$$\begin{vmatrix} 5 & -1 & 3 \\ -2 & 1 & 7 \\ 2 & -6 & 2 \end{vmatrix}$$

$$= 5\begin{vmatrix} 1 & 7 \\ -6 & 2 \end{vmatrix} - (-1)\begin{vmatrix} -2 & 7 \\ 2 & 2 \end{vmatrix} + 3\begin{vmatrix} -2 & 1 \\ 2 & -6 \end{vmatrix}$$

$$= 5[1(2) - (-6)(7)] + 1[-2(2) - 2(7)] + 3[-2(-6) - 2(1)]$$

$$= 5[2 + 42] + 1[-4 - 14] + 3[12 - 2]$$

$$= 5(44) + 1(-18) + 3(10)$$

$$= 220 - 18 + 30$$

$$= 232$$