Topic 3 // Three Variable Systems "A"

1

① $x - y + z = -1$
② $x + y + 3z = -3$
③ $2x - y + 2z = 0$

① $x - y + z = -1$
② $x + y + 3z = -3$
④ $2x + 4z = -4$

② $x + y + 3z = -3$
③ $2x - y + 2z = 0$
⑤ $3x + 5z = -3$

④ $3[2x + 4z = -4]$
⑤ $-2[3x + 5z = -3]$

$6x + 12z = -12$
$-6x - 10z = 6$
$2z = -6$
$\frac{2z}{2} = \frac{-6}{2}$ → $\boxed{z = -3}$

$x - y + z = -1$
$(4) - y + (-3) = -1$
$4 - y - 3 = -1$
$-y = -1$
$\frac{-y}{-1} = \frac{-2}{-1}$ → $\boxed{y = 2}$

$2x + 4(-3) = -4$
$2x - 12 = -4$
$+12 \quad +12$
$\frac{2x}{2} = \frac{8}{2}$ → $\boxed{x = 4}$

$(4, 2, -3)$

2

① $x - y - 2z = 4$
② $-x + 2y + z = 1$
③ $-x + y - 3z = 11$

① $x - y - 2z = 4$
② $-x + 2y + z = 1$
④ $y - z = 5$

① $x - y - 2z = 4$
③ $-x + y - 3z = 11$
⑤ $-5z = 15$
$\frac{-5z}{-5} = \frac{15}{-5}$
$\boxed{z = -3}$

$x - y - 2z = 4$
$x - (2) - 2(-3) = 4$
$x - 2 + 6 = 4$
$x + 4 = 4$
$-4 \quad -4$ → $\boxed{x = 0}$

$y - (-3) = 5$
$y + 3 = 5$
$-3 \quad -3$ → $\boxed{y = 2}$

$(0, 2, -3)$

3 ① $x - 2y + z = -4$

② $-4x + y - 2z = 1$

③ $2x + 2y - z = 10$

$2 \times$ ② $\rightarrow x - 2y + z = -4$, $-8x + 2y - 4z = 2$

③ $2x + 2y - z = 10$

① $x - 2y + z = -4$

② $-8x + 2y - 4z = 2$

④ $-7x - 3z = -2$

① $x - 2y + z = -4$

③ $2x + 2y - z = 10$

⑤ $\frac{3x}{3} = \frac{6}{3}$

$x = 2$

④ $-7(2) - 3z = -2$

$-14 - 3z = -2$

$+14 \quad +14$

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

$z = -4$

① $x - 2y + z = -4$

$(2) - 2y + (-4) = -4$

$2 - 2y - 4 = -4$

$-2 - 2y = -4$

$+2 \quad +2$

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

$y = 1$

$(2, 1, -4)$

4 ① $x - 3y + 3z = -4$

② $2x + 3y - z = 15$

③ $4x - 3y - z = 19$

① $x - 3y + 3z = -4$

② $2x + 3y - z = 15$

④ $3x + 2z = 11$

② $2x + 3y - z = 15$

③ $4x - 3y - z = 19$

⑤ $6x - 2z = 34$

$3x + 2z = 11$

$6x - 2z = 34$

$\frac{9x}{9} = \frac{45}{9}$

$x = 5$

$x - 3y + 3z = -4$

$(5) - 3y + 3(-2) = 4$

$5 - 3y - 6 = 4$

$-1 - 3y = 4$

$+1 \quad +1$

$\frac{-3y}{-3} = \frac{5}{-3}$ $\quad y = -\frac{5}{3}$

$3(5) + 2z = 11$

$15 + 2z = 11$

$-15 \quad -15$

$\frac{2z}{2} = \frac{-4}{2}$

$z = -2$

5 ① ② $(2x + y - z = 5)$ → ① $4x + 2y - 2z = 10$

② $x + 4y + 2z = 16$ ② $x + 4y + 2z = 16$

③ $15x + 6y - 2z = 12$ ③ $15x + 6y - 2z = 12$

↓ ① $4x + 2y - 2z = 10$ ② $x + 4y + 2z = 16$

② $x + 4y + 2z = 16$ ③ $15x + 6y - 2z = 12$

④ $5x + 6y = 26$ ⑤ $16x + 10y = 28$

$x + 4y + 2z = 16$

$(-2) + 4(6) + 2z = 16$

$-2 + 24 + 2z = 16$

$22 + 2z = 16$

$-22 \quad -22$

$\frac{2z}{2} = \frac{-6}{2}$ → $z = -3$

$5(5x + 6y = 26)$

$-3(16x + 10y = 28)$

$25x + 30y = 130$

$-48x - 30y = -84$

$\frac{-23x}{-23} = \frac{+46}{-23}$

$x = -2$

$5(-2) + 6y = 26$

$-10 + 6y = 26$

$+10 \quad +10$

$\frac{6y}{6} = \frac{36}{6}$ → $y = 6$

$(-2, 6, -3)$

6 $-2(x - 2y + 3z = 12)$ → $-2x + 4y - 6z = -24$

$2x - y - 2z = 5$ $2x - y - 2z = 5$

$2x + 2y - z = 4$ $2x + 2y - z = 4$

$-2x + 4y - 6z = -24$ $-2x + 4y - 6z = -24$

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

$3y - 8z = -19$ $6y - 7z = -20$

$x - 2y + 3z = 12$

$x - 2(-1) + 3(2) = 12$

$x + 2 + 6 = 12$

$x + 8 = 12$

$-8 \quad -8$

$x = 4$

$-2(3y - 8z = -19)$

$6y - 7z = -20$

$-6y + 16z = 38$

$\frac{9z}{9} = \frac{18}{9}$

$z = 2$

$3y - 8z = -19$

$3y - 8(2) = -19$

$3y - 16 = -19$

$+16 \quad +16$

$3y = -3$ → $y = -1$

$(4, -1, 2)$

7 $2(x-3y+z=6) \rightarrow 2x-6y+2z=12$

$2(2x-5y-z=-2) \rightarrow 4x-10y-2z=-4$

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

$2x-6y+2z=12$ + $4x-10y-2z=-4$

$6x-16y=8$

$4x-10y-2z=-4$ + $-x+y+2z=7$

$3x-9y=3$

$6x-16y=8 \rightarrow 6x-16y=8$

$-2[3x-9y=3] \rightarrow -6x+18y=-6$

$\frac{12}{12}y=\frac{2}{2}$

$y=1$

$3x-9(1)=3$

$3x-9=3$

$+9 \quad +9$

$\frac{3x}{3}=\frac{12}{3}$

$x=4$

$-(4)+(1)+2z=7$

$-4+1+2z=7$

$-3+2z=7$

$+3 \quad +3$

$\frac{2z}{2}=\frac{10}{2}$

$z=5$

$(4,1,5)$

8 $2(3x+2y-z=12) \rightarrow 6x+4y-2z=24$

$-4x+y-2z=4 \quad -4x+y-2z=4$

$2(x-3y+z=-4) \rightarrow 2x-6y+2z=-8$

$6x+4y-2z=24$ + $2x-6y+2z=-8$

$8x-2y=16$

$-4x+y-2z=4$ + $2x-6y+2z=-8$

$-2x-5y=-4$

$8x-2y=16$

$+[-2x-5y=-4] \rightarrow -8x-20y=-16$

$\frac{-22y}{-22}=\frac{0}{-22}$

$y=0$

$8x-2(0)=16$

$\frac{8x}{8}=\frac{16}{8}$

$x=2$

$(2)-3(0)+z=-4$

$2-0+z=-4$

$2+z=-4$

$-2 \quad -2$

$z=-6$

$(2,0,-6)$