

Unit 9 Test — Answer Key

Solving Systems, Matrix Operations & Gaussian Elimination

FOR TEACHER / SELF-CHECK USE

This test was written to cover Unit 9's topics (systems of linear and nonlinear equations, systems of inequalities, matrix operations, and Gaussian elimination). Every solution below has been independently verified.

1	Substitute: $3x + (2x+1) = 11 \rightarrow 5x + 1 = 11 \rightarrow 5x = 10 \rightarrow x = 2$. $y = 2(2)+1 = 5$. Answer: A — (2, 5)
2	Add the equations: $(2x+y) + (x-y) = 7+2 \rightarrow 3x = 9 \rightarrow x = 3$. $y = 7 - 2(3) = 1$. Answer: A — (3, 1)
3	Set equal: $x^2 = 2x + 3 \rightarrow x^2 - 2x - 3 = 0 \rightarrow (x-3)(x+1) = 0 \rightarrow x = 3$ or $x = -1$. $x=3: y=9$. $x=-1: y=1$. Answer: (3, 9) and (-1, 1)
4	Add corresponding entries: $1+5=6$, $2+6=8$, $3+7=10$, $4+8=12$. Answer: A — [[6, 8], [10, 12]]
5	Row 1: $(1 \cdot 2 + 2 \cdot 1, 1 \cdot 0 + 2 \cdot 2) = (4, 4)$. Row 2: $(3 \cdot 2 + 4 \cdot 1, 3 \cdot 0 + 4 \cdot 2) = (10, 8)$. Answer: A — [[4, 4], [10, 8]]
6	Determinant of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $ad - bc$: $3(5) - 4(2) = 15 - 8$. Answer: 7
7	Add the equations: $(x+y) + (2x-y) = 5+1 \rightarrow 3x = 6 \rightarrow x = 2$. $y = 5 - 2 = 3$. Answer: A — (2, 3)
8	Test each point in $y < -2x+5$: $(0,0)$: $0 < 5$ true. $(3,0)$: $0 < -1$ false. $(1,4)$: $4 < 3$ false. $(-1,10)$: $10 < 7$ false. Only $(0,0)$ satisfies the inequality. Answer: A — (0, 0)
9	Subtract eq1 from eq2: $(2x-y+z)-(x+y+z) = 3-6 \rightarrow x - 2y = -3$. Subtract eq1 from eq3: $(x+2y-z)-(x+y+z) = 2-6 \rightarrow y - 2z = -4$. From eq1: $z = 6-x-y$. Substitute into $y-2z=-4$: $y-2(6-x-y)=-4 \rightarrow y-12+2x+2y=-4 \rightarrow 2x+3y=8$. Combine with $x-2y=-3$ (so $x=2y-3$): $2(2y-3)+3y=8 \rightarrow 4y-6+3y=8 \rightarrow 7y=14 \rightarrow y=2$. Then $x=2(2)-3=1$, $z=6-1-2=3$. Answer: x = 1, y = 2, z = 3
10	Substitute $y=x+1$ into $x^2+y^2=25$: $x^2 + (x+1)^2 = 25 \rightarrow 2x^2+2x+1=25 \rightarrow 2x^2+2x-24=0 \rightarrow x^2+x-12=0 \rightarrow (x+4)(x-3)=0$. $x=-4: y=-3$. $x=3: y=4$. Answer: (-4, -3) and (3, 4)