

SAT Nonlinear Equations and Systems Worksheet

Name: _____ Date: _____

Circle one answer for each question. Use the blank space for calculations. A calculator is allowed.

1. What are the solutions to $x^2 - 7x + 10 = 0$?

- A. -5 and -2
- B. -2 and 5
- C. 2 and 5
- D. 1 and 10

2. What are the solutions to $|x - 4| = 9$?

- A. 13 only
- B. 5 and 13
- C. -13 and 5
- D. -5 and 13

3. What are all solutions to $2x^2 = 8x$?

- A. 0 and 4
- B. 4 only
- C. -4 and 4
- D. 0 and -4

4. What value of x satisfies $\sqrt{x+5} = 4$?

- A. -1
- B. 3
- C. 11
- D. 21

5. What is the solution to $\frac{6}{x-1} = \frac{3}{x-4}$?

- A. -2
- B. 3
- C. 5
- D. 7

6. How many distinct real solutions does $2x^2 - 4x + 5 = 0$ have?

- A. Zero
- B. Exactly one
- C. Exactly two
- D. Infinitely many

7. Which point (x, y) is a solution to the system of equations $x^2 + y^2 = 25$ and $y = x + 1$?

- A. $(0, 5)$
- B. $(3, 4)$
- C. $(4, 3)$
- D. $(-3, -2)$

8. What are all values of x that satisfy $x = \sqrt{3x + 10}$?

- A. -2 only
- B. -2 and 5
- C. 5 only
- D. 2 and 5

9. What is the larger solution to $x^2 - 6x + 4 = 0$?

- A. $-3 + \sqrt{5}$
- B. $3 + \sqrt{5}$
- C. $3 + \sqrt{13}$
- D. $6 + 2\sqrt{5}$

10. In the xy -plane, the graphs of $y = x^2 + 6x$ and $y = c$ intersect at exactly one point, where c is a constant. What is the value of c ?
- A. -9
B. -3
C. 0
D. 9
11. What value of x satisfies $\frac{x}{x-3} = \frac{3}{x-3} + 2$?
- A. 0
B. 3
C. 6
D. No value of x satisfies the equation.
12. The graphs of $y = x^2 - 2x - 3$ and $y = -x + k$ in the xy -plane intersect at a point with x -coordinate 4 , where k is a constant. What is the x -coordinate of the other intersection point?
- A. -4
B. -3
C. 3
D. 9

Answer key

1 C · 2 D · 3 A · 4 C · 5 D · 6 A · 7 B · 8 C · 9 B · 10 A · 11 D · 12 B

1. C: 2 and 5

Factor: $(x - 2)(x - 5) = 0$, so $x = 2$ or $x = 5$. Choice A has the signs reversed; those are the solutions to $x^2 + 7x + 10 = 0$.

2. D: -5 and 13

The expression inside the absolute value bars equals 9 or -9. If $x - 4 = 9$, then $x = 13$. If $x - 4 = -9$, then $x = -5$.

3. A: 0 and 4

Move every term to one side: $2x^2 - 8x = 0$, so $2x(x - 4) = 0$ and $x = 0$ or $x = 4$. Dividing both sides by x loses the solution 0.

4. C: 11

Square both sides: $x + 5 = 16$, so $x = 11$. Check: $\sqrt{16}$ is 4. Choice B comes from doubling 4 instead of squaring it.

5. D: 7

Cross-multiply: $6(x - 4) = 3(x - 1)$, so $6x - 24 = 3x - 3$ and $x = 7$. Check: $\frac{6}{6} = 1$ and $\frac{3}{3} = 1$. Choice A multiplies each numerator by its own denominator: $6(x - 1) = 3(x - 4)$.

6. A: Zero

The discriminant is $b^2 - 4ac = (-4)^2 - 4(2)(5) = 16 - 40 = -24$. A negative discriminant means there are no real solutions.

7. B: (3, 4)

A solution must satisfy both equations. For (3, 4), $3^2 + 4^2 = 25$ and $4 = 3 + 1$. Choices A and C satisfy only the first equation, and choice D satisfies only the second.

8. C: 5 only

Squaring gives $x^2 = 3x + 10$, so $(x - 5)(x + 2) = 0$. Check both: $\sqrt{25}$ is 5, so 5 works. $\sqrt{4}$ is 2, not -2, so -2 does not.

9. B: $3 + \sqrt{5}$

Complete the square: $x^2 - 6x + 9 = 5$, so $(x - 3)^2 = 5$. The solutions are $3 + \sqrt{5}$ and $3 - \sqrt{5}$. Choice D skips dividing by 2 in the quadratic formula.

10. A: -9

A horizontal line meets this upward-opening parabola exactly once, at its vertex. The vertex has $x = -\frac{6}{2} = -3$ and $y = (-3)^2 + 6(-3) = -9$, so $c = -9$. Choice B is the x-coordinate of the vertex.

11. D: No value of x satisfies the equation.

Multiplying both sides by $x - 3$ gives $x = 3 + 2(x - 3)$, so $x = 3$. But $x = 3$ makes both denominators 0, so it is not a solution, and the equation has no solution.

12. B: -3

At $x = 4$, the parabola has $y = 16 - 8 - 3 = 5$, so $5 = -4 + k$ and $k = 9$. Setting $x^2 - 2x - 3 = -x + 9$ gives $x^2 - x - 12 = 0$, or $(x - 4)(x + 3) = 0$. The other intersection has $x = -3$. Choice D is the value of k .