

Nonlinear Systems, Systems of Inequalities, and Linear Programming

Systems beyond lines, feasible regions, graphing systems of inequalities, optimization, and modeling constraints.

Name _____ Date _____

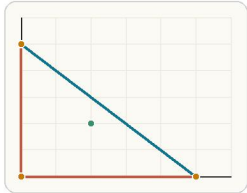
32 main 2-up grid 3 pages

Completion Reward



Shown here as a small pack artifact, not a preview destination.

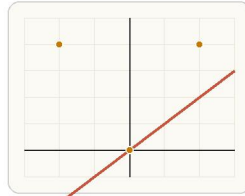
1. In linear programming, what is the feasible region?



In linear programming, feasible points are exactly the points that satisfy every constraint simultaneously.

- A. The set of points that satisfy all constraints.
- B. The objective function only.
- C. The line with greatest slope.
- D. The x-axis region only.

2. What does it mean to solve a nonlinear system?



Even when one graph is curved, solving the system still means finding points that satisfy every equation together.

- A. Find points that satisfy every equation, even when one graph is curved.
- B. Only find x-intercepts.
- C. Rewrite every equation as linear.
- D. Solve each equation separately and ignore overlap.

3. Where do maxima or minima usually occur in a linear-programming feasible region?



For a polygonal feasible region, test the objective function at the corner points to find extrema.

- A. At the center of the feasible region
- B. At every point equally
- C. At a vertex of the feasible region
- D. Always on the y-axis

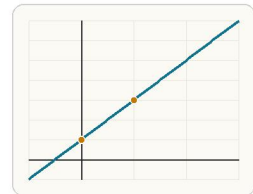
4. What does the objective function do in linear programming?

- A. It defines the feasible region.
- B. It replaces the constraints.
- C. It lists the x-intercepts.
- D. It measures the quantity you want to maximize or minimize.

5. What does shading represent on an inequality graph?

- A. The set of points that satisfy the inequality.
- B. Only the axis of symmetry.
- C. The determinant region.
- D. The set of points on the boundary line only.

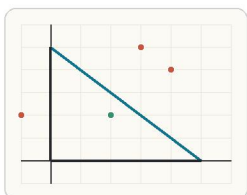
6. What boundary line goes with $y \leq 2x + 1$?



The boundary line of an inequality graph comes from changing the inequality sign to equality.

- A. $y = 2x + 1$
- B. $y = -2x + 1$
- C. $x = 2y + 1$
- D. $y = 1$

7. Which point satisfies $x \geq 0$, $y \geq 0$, and $x + y \leq 5$?



A feasible point must stay in the first quadrant and lie on or below $x + y = 5$.

- A. (4, 4)
- B. (-1, 2)
- C. (3, 5)
- D. (2, 2)

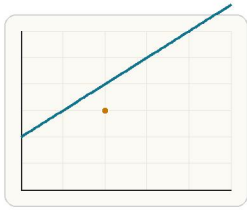
8. What is the best first step to solve $y = x$ and $x^2 + y^2 = 18$?

- A. Substitute x for y in the second equation.
- B. Graph the first equation only.
- C. Take the square root of 18 first and stop.
- D. Subtract x from both equations.

9. A student says a feasible region can ignore one constraint if the point looks close enough. What is the mistake?

- A. Only the objective matters.
- B. Only x-constraints matter.
- C. Graphs are only rough sketches.
- D. A feasible point must satisfy every constraint.

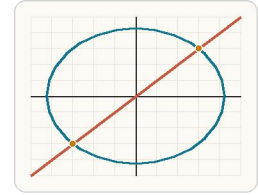
10. Does the point (2, 3) satisfy $y \leq x + 2$? Answer 1 for yes and 0 for no.



Check whether the point falls on or below the line $y = x + 2$.

11. Does the point (4, 1) satisfy $y \geq x - 1$? Answer 1 for yes and 0 for no.

12. For $y = x$ and $x^2 + y^2 = 18$, find the positive x-value of an intersection point. Answer with a number.



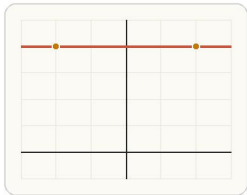
Shared points satisfy both the line and the circle.

13. For $y = x$ and $x^2 + y^2 = 18$, find the positive y-value of an intersection point. Answer with a number.

14. Evaluate $P = 3x + 2y$ at the point (4, 1). Answer with a number.

15. Evaluate $C = 5x + y$ at the point (2, 6). Answer with a number.

16. For $y = x^2$ and $y = 4$, find the positive x-value of intersection. Answer with a number.



Intersections occur where both graphs share the same y-value.

17. For $y = x^2$ and $y = 4$, find the negative x-value of intersection. Answer with a number.

18. Evaluate $P = 3x + 2y$ at (0, 5). Answer with a number.

19. Evaluate $P = 3x + 2y$ at (5, 0). Answer with a number.

20. Which is larger: P at (0, 5) or P at (5, 0) for $P = 3x + 2y$? Enter the larger value. Answer with a number.

21. Does (1, 4) satisfy $x + y \leq 5$? Answer 1 for yes and 0 for no.

22. For $y = x^2$ and $x = 3$, what is y? Answer with a number.

23. For $y = 0$ and $x^2 + y^2 = 16$, what is the positive x-value? Answer with a number.

24. For $y = 0$ and $x^2 + y^2 = 16$, what is the negative x-value? Answer with a number.

25. Evaluate $C = 2x + 7y$ at (3, 2). Answer with a number.

26. State the region for points that satisfy both $x \geq 0$ and $y \geq 0$. Answer with a region name.

27. Solve $y = x^2$ and $y = 9$. Answer in the form $x = \dots$

28. State the boundary line for $y > -x + 5$. Answer as an equation.

29. Write the objective value expression for profit $P = 4x + 3y$. Answer in the form $P = \dots$

30. Solve $y = x^2$ and $y = x^2$. Answer in the form $y = \dots$

31. State the region satisfying $x \geq 0$ and $y \geq 0$.
Answer with a region name.

32. Which strategy is best for maximizing $P = 3x + 2y$ on a polygonal feasible region?

- A. Average all feasible points.
- B. Check only the y-intercept.
- C. Evaluate P at each vertex.
- D. Use the largest x-value automatically.