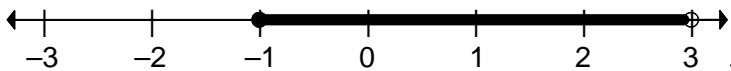


MATH 100 – Intermediate Algebra

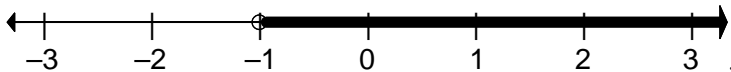
Topics and Sample Problems for the Final Exam

Linear Equations and Inequalities

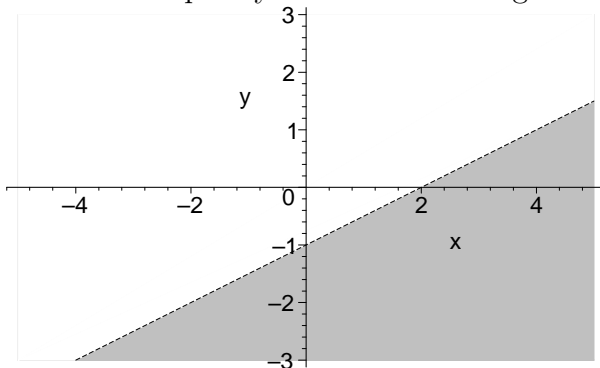
1. Solve for t : $-2(t + 3) = 9 - 5t$.
2. Solve for x : $\frac{11x}{6} + \frac{1}{3} = 2x$.
3. Solve for x : $|x + 2| = 8$.
4. Determine the interval represented by the graph in the figure.



5. Determine the interval represented by the graph in the figure.

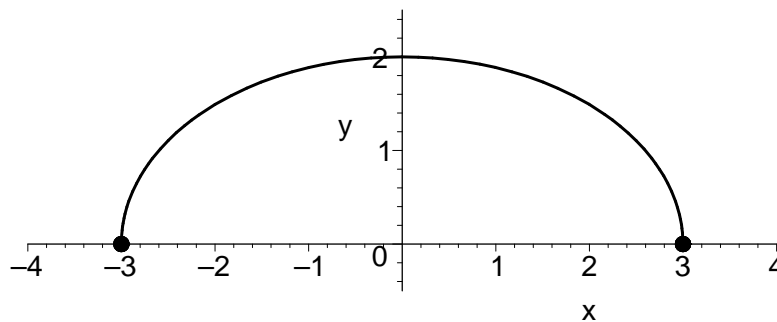


6. Solve for x : $\frac{x}{6} - 1 \leq \frac{x}{4}$.
7. Solve for x : $-1 \leq \frac{2x + 2}{3} < 2$.
8. Solve for x : $|x - 3| \leq 6$
9. Graph the inequality $3x + 2y \leq 6$.
10. Write an inequality for the shaded region shown in the figure.



Graphs and Functions

11. Which of the following ordered pairs is not a solution of the equation $x^2 + 2y = -5$.
- (a) $(3, -7)$ (b) $(-3, -7)$ (c) $\left(0, -\frac{5}{2}\right)$ (d) $(1, -6)$
12. Find the distance between the points $(5, 2)$ and $(8, 3)$.
13. Find the midpoint of the line segment joining the points $(-3, -2)$ and $(7, 2)$.
14. Find the x -intercept and the y -intercept of the graph of the equation $3x - 2y = 12$. Graph $3x - 2y = 12$.
15. Find the slope of the line through the points $(-1, 1)$ and $(6, 3)$. What is the equation of this line?
16. Find the slope of the line perpendicular to the line containing the points $(1, -4)$ and $(-8, -6)$.
17. Find the slope of the line $3x + 2y - 2 = 0$.
18. Decide whether the pair of lines is parallel, perpendicular, or neither.
 $2x + 3y = -2$ and $2y = 3x + 11$
19. Evaluate $f(-1)$ if $f(x) = 3 - 7x$.
20. Evaluate $k(2t)$ if $k(x) = x^2 + 5$.
21. Let $f(x) = 3x + 4$. Evaluate $\frac{f(x+1) - f(1)}{x}$.
22. Let $g(x) = \begin{cases} -x^2 + 2x - 5, & \text{if } x \leq 1 \\ 7x - 2, & \text{if } x > 1 \end{cases}$. Find $g(-3)$ and $g(2)$.
23. Find the domain of the function $f(t) = \frac{t+3}{t(t+2)}$.
24. Find the domain of the function $f(x) = \sqrt{1-2x}$.
25. The graph of the function f is shown in the following figure. Find the domain and range of f .



26. The value of John's painting bought today is \$30,000. After 4 years, the value of his painting will have appreciated to \$50,000. Find the value V of John's painting as a linear function of t , the number of years since the painting was purchased.

Systems of Equations and Inequalities

27. Solve the system of equations

$$\begin{aligned}x + y &= 0 \\x - y &= 4.\end{aligned}$$

28. Solve the system of equations

$$\begin{aligned}2x + 3y &= 5 \\3x - 2y &= 4.\end{aligned}$$

29. A bag contains 85 coins, all dimes and quarters. Find the number of dimes and the number of quarters if the value of the coins is \$12.25.

Polynomial and factoring

30. Simplify: $\frac{2x^{-1}y}{xy^{-2}}$.

31. Multiply and simplify: $2x(x - 4) - (x + 2)(x - 1)$

32. Factor: $x^3 - 2x^2 - 2x + 4$

33. Factor: $3x^2 - 13x - 16$

34. Factor: $16x^2 - 49y^2$

35. The area of a rectangular garden is represented by the algebraic expression $2x^2 + 7x - 15$. If its width is represented by $x + 5$, what is the algebraic expression for its length?

36. One positive number is one less than six times another positive number. Their product is 12. Find these two numbers.

37. Solve for x : $x^2 - 3x = 4$

38. Solve for x : $x^3 - 4x^2 + 3x = 0$

39. Solve for x : $x^3 = 4x$

Rational Expressions, Equations, and Functions

40. Simplify: $\frac{1 - 2x}{2x^2 + 5x - 3}$

41. Add and simplify: $\frac{x}{x - 1} + \frac{3x}{x^2 - 1}$

42. Simplify: $\frac{\frac{9x^7}{16y^6}}{\frac{3x^3}{4y^4}}$
43. Simplify: $\frac{1 - \frac{1}{x}}{1 - \frac{1}{x^2}}$
44. Simplify: $\frac{x^2 + 2x - 3}{x^2 - 1}$
45. Simplify: $\left(\frac{18a - 12a^2}{4a^2 + 4a + 1}\right) \left(\frac{4a^2 + 8a + 3}{4a^2 - 9}\right)$
46. Divide and simplify: $\frac{6a^2b^2}{a^3 - 8} \div \frac{3ab^2}{a - 2}$
47. Simplify: $\left(\frac{9x^2}{y^3}\right)^3 \left(\frac{15x^2}{y^{-2}}\right)^{-2}$
48. Solve for y : $\frac{2}{y + 4} - \frac{7}{y - 4} = \frac{4}{y^2 - 16}$
49. Find $\frac{f(2 + h) - f(2)}{h}$ for the function $f(x) = \frac{1}{x + 2}$.

Radicals

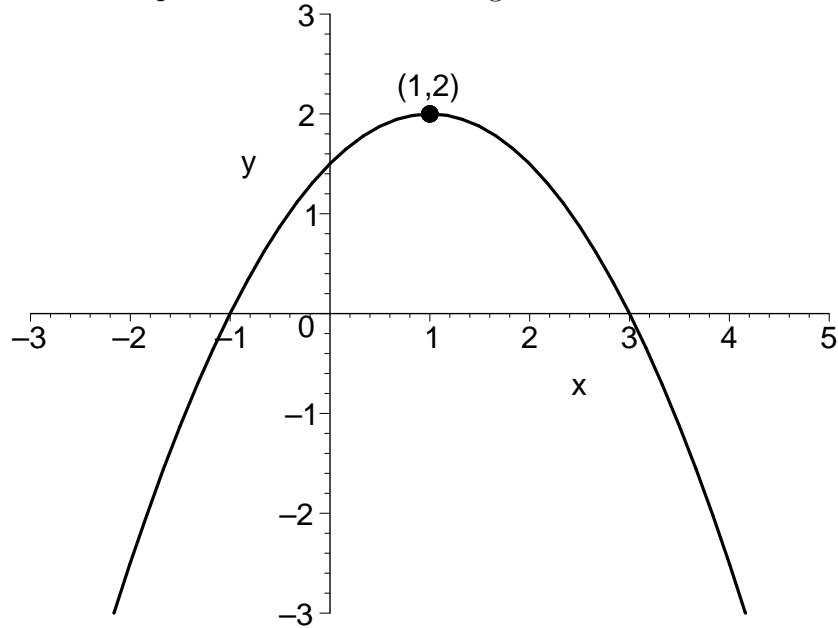
50. Combine: $\sqrt{27a} - \sqrt{75a}$
51. Simplify: $\sqrt[5]{\frac{x^{10}}{32y^5}}$ (x and y are positive real numbers)
52. Rationalize the denominator and simplify: $\frac{4}{\sqrt{2} - 5}$
53. Solve for x : $\sqrt{x + 4} + 2 = x$.
54. Solve for x : $\frac{3}{\sqrt{2 - x}} = 4$

Quadratic Equations and Functions

55. Solve for x : $6x^2 - 7x = 20$
56. Solve for m : $2m^2 + 6m + 2 = 0$
57. Find the value of k that makes the expression $x^2 - 4x + k$ a perfect square trinomial. Then, write the resulting trinomial as the square of a binomial.

58. Find the vertex of the parabola $y = x^2 - 8x + 2$.

59. Write an equation of the parabola shown in the figure.



Conics

60. Identify the graph of the equation $2x^2 + 3y^2 = 24$.

- (a) Circle (b) Parabola (c) Ellipse (d) Hyperbola

61. Find an equation of a circle with center at the point $(-1, 3)$ and radius 4.

62. Determine whether the graph of the equation is a parabola, circle, ellipse, or hyperbola.

- (a) $4x^2 + 9y^2 = 9$ (b) $4x + 9y^2 = 9$ (c) $4x^2 - 9y^2 = 9$ (d) $4x^2 + 4y^2 = 9$

63. Determine whether the equation $x^2 + y^2 + 6x - 4y - 3 = 0$ is a parabola, circle, ellipse, or hyperbola. If it is a circle, find its center and radius.

Answers

1. 5

2. 2

3. $6, -10$

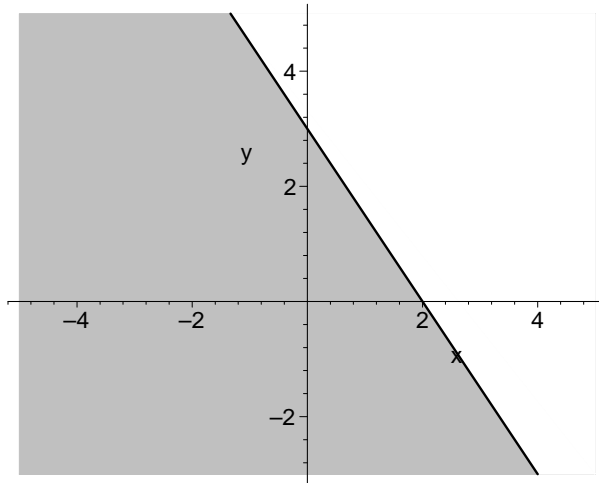
4. $[-1, 3)$

5. $(-1, \infty)$

6. $x \geq -12$

7. $-\frac{5}{2} \leq x < 2$

8. $-3 \leq x \leq 9$



9.

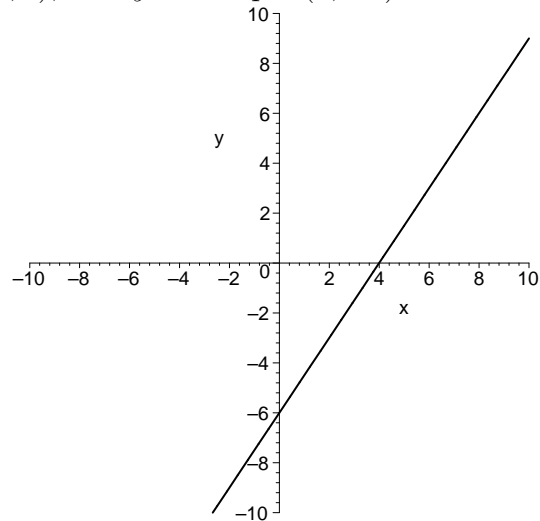
10. $x - 2y > 2$

11. (d) $(1, -6)$

12. $\sqrt{10}$

13. $(2, 0)$

14. x -intercept: $(4, 0)$; y -intercept: $(0, -6)$



15. slope: $\frac{2}{7}$; equation: $y = \frac{2}{7}x + \frac{9}{7}$

16. $-\frac{9}{2}$

17. $-\frac{3}{2}$

18. perpendicular

19. 10
20. $4t^2 + 5$
21. 3
22. $g(-3) = -20$ and $g(2) = 12$
23. All real numbers $t \neq -2, 0$
24. $\{x|x \leq \frac{1}{2}\}$
25. Domain: $[-3, 3]$; Range: $[0, 2]$
26. $V = 5000t + 30000$
27. $x = 2, y = -2$
28. $x = \frac{22}{13}, y = \frac{7}{13}$
29. Number of dimes: 60; number of quarters: 25
30. $\frac{2y^3}{x^2}$
31. $x^2 - 9x + 2$
32. $(x - 2)(x^2 - 2)$
33. $(x + 1)(3x - 16)$
34. $(4x + 7y)(4x - 7y)$
35. $2x - 3$
36. $\frac{3}{2}, 8$
37. 4, -1
38. 0, 1, 3
39. -2, 0, 2
40. $\frac{-1}{x + 3}$
41. $\frac{x(x + 4)}{x^2 - 1}$
42. $\frac{3x^4}{4y^2}$
43. $\frac{x}{x + 1}$

44. $\frac{x+3}{x+1}$
45. $\frac{-6a}{2a+1}$
46. $\frac{2a}{a^2+2a+4}$
47. $\frac{81x^2}{25y^{13}}$
48. -8
49. $\frac{-1}{4(4+h)}$
50. $-2\sqrt{3a}$
51. $\frac{x^2}{2y}$
52. $\frac{4\sqrt{2}+20}{-23}$
53. 5
54. $\frac{23}{16}$
55. $-\frac{4}{3}, \frac{5}{2}$
56. $\frac{-3+\sqrt{5}}{2}, \frac{-3-\sqrt{5}}{2}$
57. $k=4, (x-2)^2$
58. $(4, -14)$
59. $y = -\frac{1}{2}(x-1)^2 + 2$
60. ellipse
61. $(x+1)^2 + (y-3)^2 = 16$
62. (a) ellipse (b) parabola (c) hyperbola (d) circle
63. circle; center: $(-3, 2)$; radius: 4