Solve the following.

1. \[ \frac{7}{x^2 - 5x} - \frac{2}{x - 5} = \frac{4}{x} \]

2. \[ \frac{2x - 3}{2} + \frac{5x}{x + 1} = x \]

3. \[ \sqrt{x + 3} - 3 = x \]

4. \[ \sqrt{2x} - x + 4 = 0 \]

5. \[ \sqrt[4]{x - 15} = 2 \]

6. \[ 3 \sqrt[3]{x + 2} + 9 = 3 \]

7. \[ x^2 = 2x - 10 \]

8. \[ -4x^2 = -12x + 11 \]

9. \[ |9 - 4x| = 7 \]

10. \[ |8 - 3x| - 3 = -2 \]

Solve the inequalities. Write the solution in interval notation.

11. \[ -3 \leq \frac{1}{2}x + 2 \leq 3 \]

12. \[ -3 < -6x + 3 < 2 \]

13. \[ x^2 - x - 6 \geq 0 \]

14. \[ 2x^2 - 7x - 15 < 0 \]

15. Simplify: \[ \frac{\frac{2}{a} + \frac{2}{b}}{\frac{4}{a} - \frac{4}{b}} \]
16. Simplify: \( \frac{\frac{1}{y+3} - \frac{1}{y}}{\frac{1}{y}} \)

17. Divide: \( (2x^3 - 11x^2 + 22x - 10) + (2x - 3) \)

18. Divide: \( (6m^3 + 7m^2 - 4m + 2) + (3m + 2) \)

19. Divide: \( \frac{2 + i}{2 - i} \)

20. Divide: \( \frac{14 + 5i}{3 + 2i} \)

Write an equation of a line in standard form.

21. passing through \( (2, 0) \) and \( (-3, -2) \)

22. that contains \( (2, -3) \) and is parallel to \( 3x + 4y = 7 \)

23. that contains \( (2, 1) \) and is perpendicular to \( 5x + 3y = 6 \)

Write the equation of the following circles in the form \( (x - h)^2 + (y - k)^2 = r^2 \)
Find the center and the radius.

24. \( x^2 + y^2 - 2x + 4y - 44 = 0 \)

25. \( x^2 + y^2 - 10y - 39 = 0 \)

26. \( f(x) = 3x^2 - 5 \) and \( g(x) = 4x + 7 \)
   Find: a) \( (f - g)(-2) \) b) \( (f \cdot g)(-1) \) c) \( \frac{f}{g}(-3) \)

27. Graph the following. State the domain and range.
   a) \( f(x) = x^3 \) b) \( f(x) = \sqrt{x} \) c) \( f(x) = |x| \)

28. Find the inverse function for \( f(x) = 2x + 3 \)
29. Graph the following quadratic functions. State the vertex, axis, intercepts, domain and range.

a) \( f(x) = 2(x - 1)^2 - 2 \)  

b) \( f(x) = (x - 1)^2 + 4 \)

30. Solve. Round the answer to 3 decimal places.

\[ 5^x = 13 \]

31. Solve. Round the answer to 3 decimal places.

\[ 7^{3x - 1} = 5 \]

32. Solve. \( \log_5(2x + 5) = 2 \)

33. Solve. \( \log x + \log(x - 21) = 2 \)

Write as a single logarithm

34. \( 2 \log_m a - 3 \log_m b \)

35. \( \frac{1}{2} (\log 5 + 3 \log r - 4 \log z) \)

Solve the following systems.

36. \( 6x - y = 5 \)

\( y = 11x \)

\( 2x + y + z = 3 \)

37. \( x + 2y - z = 3 \)

\( 3x - y + z = 5 \)

38. Two bicyclists leave the city at the same time traveling in opposite directions. One travels at 17 mph and the other at 13 mph. How long does it take before they are 105 miles apart?

39. Two cars leave school at the same time, traveling in the same direction. One travels at 50 mph and the other one travels at 65 mph. How long will it be before they are 75 miles apart?

40. Find two consecutive integers whose product is 132.

41. Find two consecutive even integers whose product is 224

42. Suppose that you had $15,000 to invest for 10 years. Which will yield more money?

a) 4% compounded monthly or

b) 3.75% compounded continuously
Mat 110 Final Exam Review Answers

1) \( x = \frac{9}{2} \)

2) \( x = \frac{3}{7} \)

3) \( x = -3, -2 \)

4) \( x = 8 \)

5) \( x = 31 \)

6) \( x = -10 \)

7) \( x = 1 \pm 3i \)

8) \( x = \frac{3 \pm \sqrt{2}i}{2} \)

9) \( x = \frac{1}{2}, 4 \)

10) \( x = \frac{7}{3}, 3 \)

11) \([-10, 2] \)

12) \( \left( \frac{1}{6}, 1 \right) \)

13) \(({-\infty, -2]} \cup [3, \infty) \)

14) \( \left(-\frac{3}{2}, 5 \right) \)

15) \( \frac{b + a}{2(b - a)} \)

16) \( \frac{-3}{y + 3} \)

17) \( x^2 - 4x + 5 + \frac{5}{2x - 3} \)

18) \( 2m^2 + m - 2 + \frac{6}{3m + 2} \)

19) \( \frac{3 + 4i}{5} = \frac{3}{5} + \frac{4}{5}i \)

20) \( 4 - i \)

21) \( 2x - 5y = 4 \)

22) \( 3x + 4y = -6 \)

23) \( 3x - 5y = 1 \)

24) \( C = (1, -2), r = 7 \)

25) \( C = (5,0), r = 8 \)

26) a) 8  b) -6  c) \( \frac{22}{5} \)

27) See graph

28) \( f^{-1}(x) = \frac{x - 3}{2} \)

29) See graph

30) \( x \approx 1.594 \)

31) \( x \approx 0.609 \)

32) \( x = 2 \)

33) \( x = 25 \)

34) \( \log_m \frac{a^2}{b^3} \)

35) \( \log \sqrt[3]{\frac{5r^3}{z^4}} \)

36) \((-1, -11)\)

37) \((2, 0, -1)\)

38) 3.5 hours

39) 5 hours

40) \( x = 11, 12 \) or \(-11, -12\)

41) \( x = 14, 16 \) or \(-14, -16\)

42) a) $21,812.11  
   b) $21,824.87
27. a) \( f(x) = x^3 \)

   Domain: \((-\infty, \infty)\)

   Range: \((-\infty, \infty)\)

b) \( f(x) = \sqrt{x} \)

   Domain: 

   Range: 

   \([0, \infty)\)

c) \( f(x) = |x| \)

   Domain: \((-\infty, \infty)\)

   Range: \([0, \infty)\)
29. \( f(x) = 2(x-1)^2 - 2 \)

- **Domain:** \((-\infty, \infty)\)
- **Range:** \([-2, \infty)\)
- **Vertex:** \((1, -2)\)
- **Axis:** \(x = 1\)
- **Intercepts:** \((0, 0), (2, 0)\)

b) \( f(x) = -(x+1)^2 + 4 \)

- **Domain:** \((-\infty, \infty)\)
- **Range:** \((-\infty, 4]\)
- **Vertex:** \((-1, 4)\)
- **Axis:** \(x = -1\)
- **Intercepts:** \((0, 3), (-3, 0), (1, 0)\)