Math 101 Chapter Four Practice Exam Questions

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

What is the domain of f(x)? What is its range?

1) $f(x) = \dfrac{1}{x-1} + 3$

1) _____

2) $f(x) = \dfrac{-1}{(x-2)^2} + 1$

2) _____

What are the equations of the vertical and horizontal asymptotes of the graph of the given equation?

3) $y = \dfrac{1}{(x-1)^2} + 3$

3) _____

Is f(x) an even or odd function? What symmetry does its graph exhibit?

4) $f(x) = -\dfrac{1}{x^2}$

4) _____

Explain how the graph of f can be obtained from the graph of $y = \dfrac{1}{x}$ or $y = \dfrac{1}{x^2}$.

5) $f(x) = -\dfrac{0.7}{x} - 7$

5) _____

6) $f(x) = \dfrac{1}{(x-8)^2} + 9$

6) _____
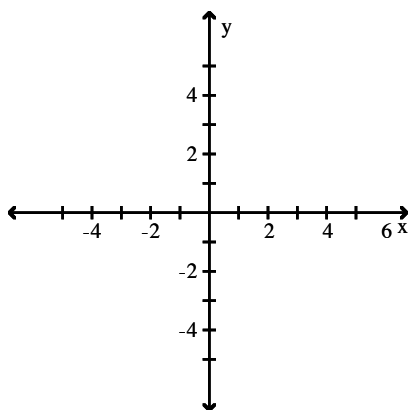
7) $f(x) = \dfrac{-7}{(x+8)^2}$

7) _____

8) $f(x) = \dfrac{-7}{(x+12)^2}$
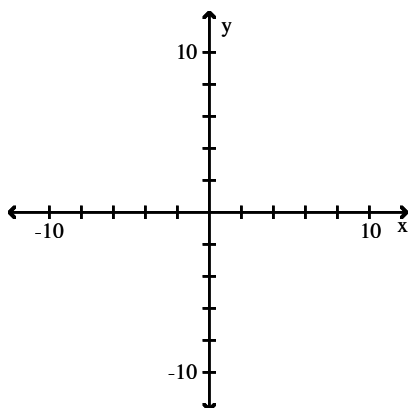
8) _____

Sketch the graph of the function.

9) $f(x) = \dfrac{1}{x - 3}$

9) _____

10) $f(x) = \dfrac{8}{x^2}$

10) _____

Rewrite $f(x) = (ax + b)/(x + c)$ in $f(x) = a + d/(x + c)$ form.

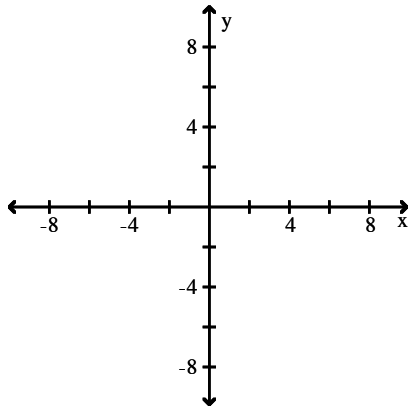11) $f(x) = \dfrac{-2x - 3}{x + 2}$

11) _____

12) $f(x) = \dfrac{3x - 5}{x - 2}$

12) _____

Graph f(x) by rewriting f(x) = (ax + b)/(x + c) in f(x) = a + d/(x + c) form.
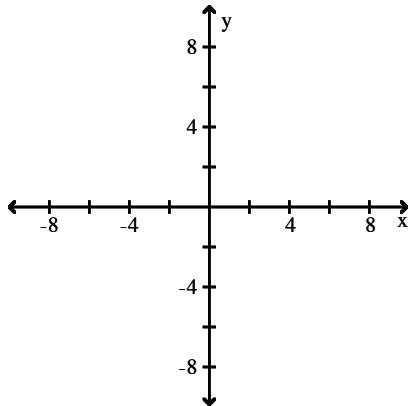
13) $f(x) = \dfrac{-2x - 3}{x + 2}$

13) _____

14) $f(x) = \dfrac{3x - 5}{x - 2}$

14) _____

Give the equations of any asymptotes of the type specified for the graph of the rational function.

15) $f(x) = \dfrac{x - 9}{x^2 + 8}$; vertical

15) _____
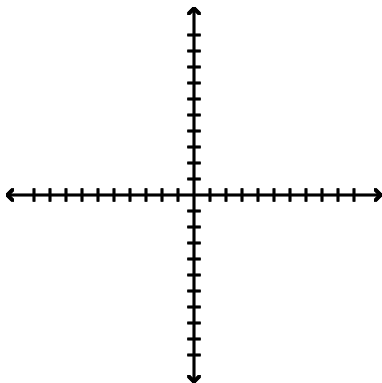
16) $f(x) = \dfrac{x + 4}{5x^2 + 8x - 8}$; oblique

16) _____

17) $f(x) = \dfrac{x^2 + x - 1}{x - 1}$; horizontal

17) _____

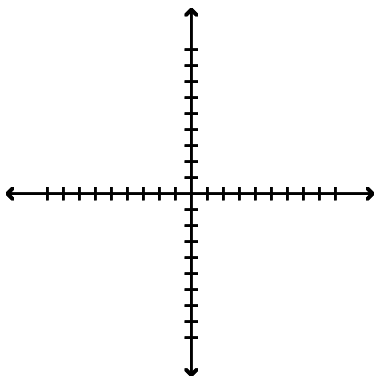**Sketch the graph the rational function, including all asymptotes.**

18) $f(x) = \dfrac{x^2 - 4}{x - 2}$
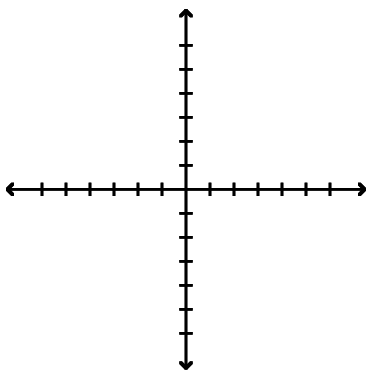
18) _____

19) $f(x) = \dfrac{x^2}{x^2 - x - 20}$
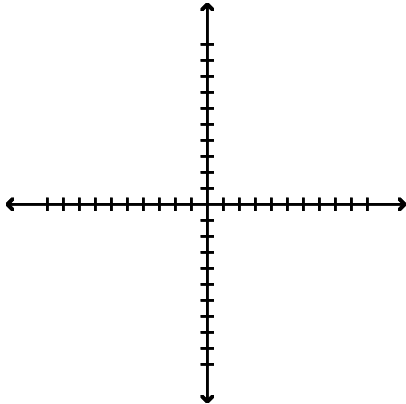
19) _____

20) $f(x) = \dfrac{x - 2}{x^2 - 4}$

20) _____

Sketch the graph of the rational function, including all asymptotes. Provide other information as requested.

21) $f(x) = \dfrac{(x^2 - 1)(5 + x)}{(x^2 - 25)(1 + x)}$
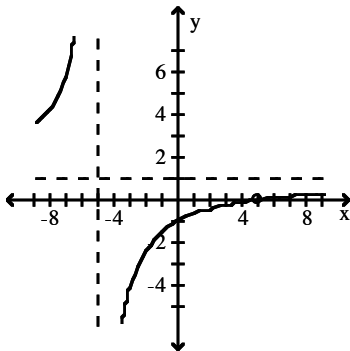
21) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Choose the equation that matches the rational function graphed.
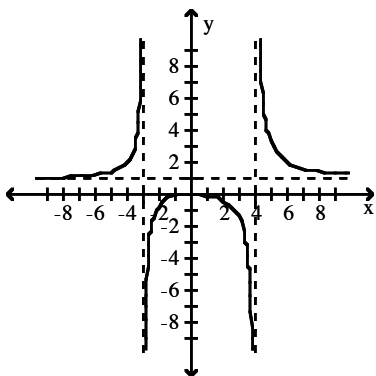
22)

22) _____

A) $f(x) = \dfrac{x - 5}{x + 5}$

B) $f(x) = \dfrac{(x - 5)^2}{(x + 5)(x - 5)}$

C) $f(x) = \dfrac{(x + 5)^2}{(x - 5)(x + 5)}$

D) $f(x) = \dfrac{(x + 5)^2}{(x - 5)(x + 5)}$

23)

A) $f(x) = \dfrac{x^2}{x^2 + x - 12}$

B) $f(x) = \dfrac{-x^2}{x^2 + x - 12}$

C) $f(x) = \dfrac{x^2}{x^2 - x - 12}$

D) $f(x) = \dfrac{-x^2}{x^2 - x - 12}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Graph the rational function and all asymptotes. Label the coordinates of any points where the graph of f intersects its oblique asymptote.

24) $f(x) = \dfrac{x^4 + x^3 + x^2 - 2x + 1}{x^3 + 1}$

24) _____
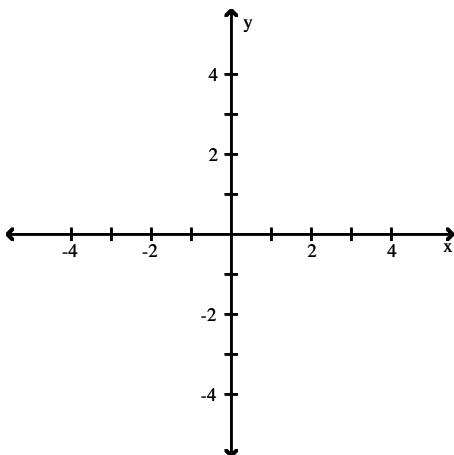
Solve the rational equation.

25) $\dfrac{8}{(x - 9)^2} = 0$

25) _____

26) $\dfrac{1}{x + 6} = \dfrac{8}{5}$

26) _____

Solve the rational inequality.

27) $\dfrac{9}{x+4} > \dfrac{6}{5}$

27) _____

28) $\dfrac{1}{x-2} + \dfrac{1}{x+2} \le -\dfrac{2}{3}$

28) _____

29) $\dfrac{7x+3}{7x^2+2} > 0$

29) _____

30) $\dfrac{-6}{x^2+1} < 0$

30) _____

Find all complex solutions for the equation.

31) $\dfrac{6}{x-2} - \dfrac{8}{x+2} = \dfrac{4}{x^2-4}$

31) _____

32) $1 - \dfrac{17}{x} + \dfrac{64}{x^2} = 0$

32) _____

33) $2x^{-2} + 4x^{-1} + 2 = 0$

33) _____

Solve the problem.

34) At a single ticket booth, customers arrive randomly at a rate of x per hour. The average line length is given by

$$f(x) = \dfrac{x^2}{400-20x},$$

where $0 \le x < 20$. To keep the wait in line reasonable, it is required that the average line length should not exceed 10 customers. Determine the range of rates at which customers can arrive before a second attendant is needed. Express your answer in interval form.

34) _____

35) If f varies jointly as q^2 and h, and $f = 36$ when $q = 3$ and $h = 2$, find q when $f = 192$ and $h = 6$.

35) _____

36) Suppose y varies directly as the square of x and inversely as m. If $y = 9$ when $x = 2$ and $m = 8$, find y when $x = 4$ and $m = 6$. Round to the nearest hundredth when necessary.

36) _____

37) Hooke's Law for an elastic spring states that the distance a spring stretches varies directly as the force applied. If a force of 25 pounds stretches a certain spring 6 inches, then how much will a force of 100 pounds stretch the spring?

37) _____

Evaluate the expression without using a calculator.

38) $100^{3/2}$

38) _____

39) $\left(\sqrt[3]{-1000}\right)^2$ 39) _____

Use positive rational exponents to rewrite the expression. Assume variables are positive.

40) $\left(\sqrt[3]{z^2}\right)^{-2}$ 40) _____

41) $\dfrac{\sqrt{y+1}}{\sqrt[7]{y+1}}$ 41) _____

Determine the domain of the function.

42) $f(x) = \sqrt{7 - 10x}$ 42) _____
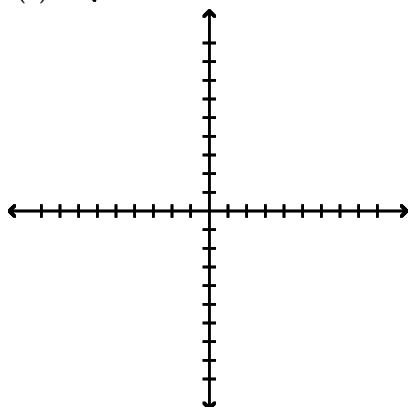
43) $f(x) = \sqrt[3]{9 - 2x}$ 43) _____

Graph the function by hand. Solve the equation f(x) = 0 by observing your graph. Round approximations to two decimal places.
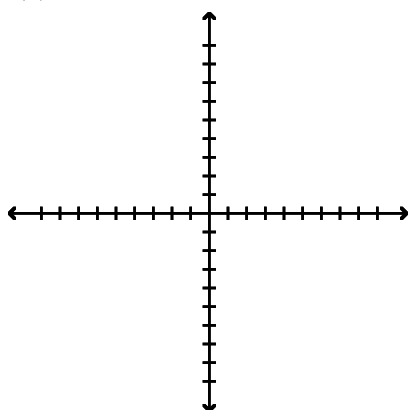
44) $f(x) = \sqrt{4x - 8}$ 44) _____

45) $f(x) = \sqrt[5]{2x + 4}$ 45) _____

Use transformations to explain how the graph of the given function can be obtained from the graph of the appropriate root function ($y = \sqrt{x}$ or $y = \sqrt[3]{x}$).

46) $f(x) = \sqrt{36x + 144}$

46) _____

47) $f(x) = \sqrt[3]{125x + 250}$

47) _____

Describe the graph of the equation as either a circle or a parabola with a horizontal axis of symmetry.
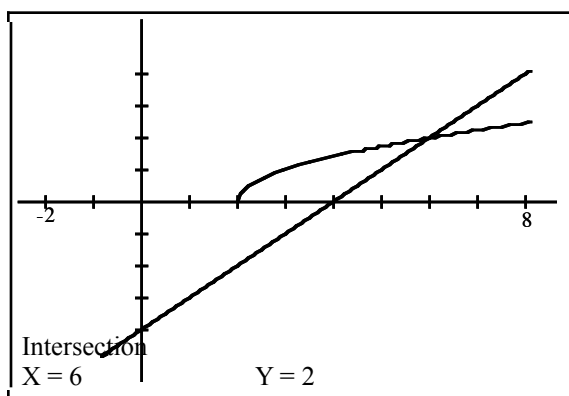
48) $(x - 1)^2 + (y + 5)^2 = 25$

48) _____

49) $x = y^2 + 4y + 4$

49) _____

Use the calculator graph to find the solution set of the given equation or inequality.
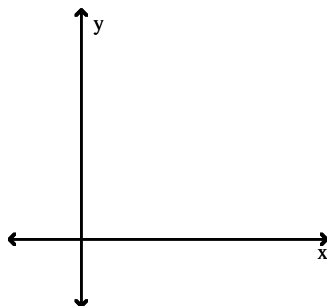
50) $\sqrt{x - 2} \leq x - 4$

50) _____

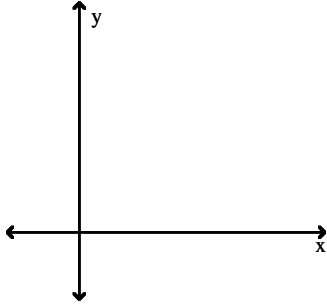Intersection
X = 6   Y = 2

Begin by drawing a rough sketch to determine the number of real solutions for the equation $y_1 = y_2$. Then use an analytic method to confirm your answer. Give the solution set and any extraneous values that may occur.

51) $y_1 = \sqrt{x}$
    $y_2 = -x + 8$

51) _____

52) $y_1 = \sqrt{x}$

$y_2 = x + 4$

52) _____

Use an analytic method to solve the equation.

53) $\sqrt{4x - 3} = 2x - 3$

53) _____

54) $\sqrt{2x + 3} - \sqrt{x + 1} = 1$

54) _____

55) $\sqrt{x + 6} + \sqrt{2 - x} = 4$

55) _____

56) $\sqrt[4]{4x + 1} = 2$

56) _____

57) $(2x + 3)^{1/2} - 1 = (x + 1)^{1/2}$

57) _____

58) $(x + 10)^{2/5} = (49x)^{1/5}$

58) _____

59) $5x^{-2} - 2x^{-1} - 3 = 0$

59) _____

Solve the equation involving "nested" radicals for all real solutions analytically.

60) $\sqrt[3]{\sqrt{2x + 5}} = \sqrt[3]{2x + 3}$

60) _____

Solve the problem.

61) Fred is in a row boat that is 5 miles from the shore of a lake. He wants to get to his house, which is 8 miles down the shore, as shown below. He will row to shore and then jog the remaining distance along the shore. He can row at 3 miles per hour and can jog at 6 miles per hour. At about what point along the shore should he beach the boat and jog the rest of the way if he wants to get home as soon as possible? Round your answer to the nearest tenth of a mile, if necessary.

61) _____
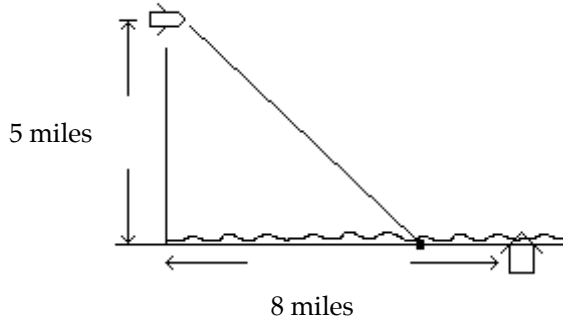
5 miles

8 miles

62) The battleship USS Tennessee is 110 miles due south of the destroyer USS Alaska and is sailing north at 40 mph. If the USS Alaska is sailing east at 25 mph, how far apart will the ships be when that distance is at a minimum? Round your answer to the nearest tenth of a mile.

62) _____