

Name: _____

Total

/ 55

MHF4U1**Unit 3: Rational Functions**

K/U /25	APP /16	COM	TH /17
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KNOWLEDGE/UNDERSTANDING**Multiple Choice***Identify the choice that best completes the statement or answers the question.*

1. Which of the following is the reciprocal of a linear function?

a. $f(x) = \frac{3}{x^2 + 1}$

c. $f(x) = \frac{x}{x+3}$

b. $f(x) = \frac{1}{x^2 + 1}$

d. $f(x) = \frac{1}{x+3}$

2. Which of the following has a horizontal asymptote at $y = 0$?

a. $f(x) = \frac{1}{3-x}$

c. $f(x) = -\frac{1}{x+2}$

b. $f(x) = \frac{1}{17x+4}$

d. all of the above

3. What is true about the function $f(x) = \frac{1}{3x+5}$ as $x \rightarrow -\frac{5}{3}^+$?

a. $f(x) \rightarrow 0$

c. $f(x) \rightarrow -\infty$

b. $f(x) \rightarrow \infty$

d. $f(x)$ is undefined

4. What is true about the function $f(x) = \frac{2x+5}{x+3}$ as $x \rightarrow \infty$?

- a. $f(x) \rightarrow \frac{5}{3}$ from above c. $f(x) \rightarrow 2$ from above
b. $f(x) \rightarrow \frac{5}{3}$ from below d. $f(x) \rightarrow 2$ from below

5. What is the x -intercept of $f(x) = \frac{1}{3x-4}$?

- a. $-\frac{1}{4}$ c. $\frac{1}{4}$
b. $\frac{4}{3}$ d. There is no x -intercept.

6. What is the y -intercept of the function $f(x) = -\frac{3}{x-3} + 1$?

- a. 2 c. 1
b. -3 d. 0

7. What is the equation of the horizontal asymptote of $f(x) = -\frac{1}{2x+10}$?

- a. $y = 0$ c. $x = 0$
b. $y = 5$ d. $x = 5$

8. What is the value of k in the function $f(x) = \frac{3-k}{2x+k}$ if its graph passes through the point $(5, -0.35)$?

- a. 10 c. $\frac{13}{4}$
b. $-\frac{47}{6}$ d. No such k exists

9. Which function has positive y-values on the entire domain?

a. $f(x) = \frac{3}{2x+4}$

c. $f(x) = \frac{1}{x^2+4}$

b. $f(x) = \frac{1}{(x-4)^2}$

d. B and C

10. Which function has a y-intercept of $\frac{1}{2}$?

a. $f(x) = \frac{2}{(2x-1)(x+1)}$

c. $f(x) = -\frac{4}{x^2-7x-8}$

b. $f(x) = \frac{2}{2x^2+5x-3}$

d. all of the above

11. Solve the equation $\frac{1}{x-4} = \frac{5}{x}$.

a. $x = -1$

c. $x = -5$

b. $x = 5$

d. no solution

12. Solve the equation $\frac{3}{x-2} = \frac{7}{4x-8}$.

a. $x = 2$

c. $x = -2$

b. $x = \frac{4}{5}$

d. no solution

13. What are the x-intercepts of the graph of $f(x) = \frac{x^2 + 4x - 21}{x^2 - 8x + 15}$?

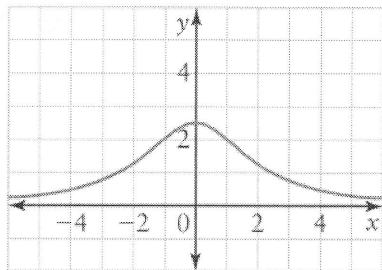
a. $-4, 5$

c. $4, -5$

b. $-7, 3$

d. $7, -3$

14. Use the graph of $f(x) = \frac{10}{x^2 + 4}$ to solve the equation $2 = \frac{10}{x^2 + 4}$



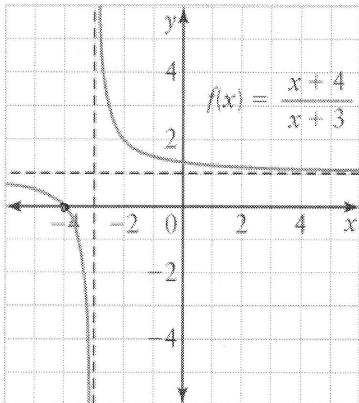
a. $x = -1.5, +1.5$

c. $x = 0$

b. $x = -1, +1$

d. no solution

15. Use the graph of $f(x) = \frac{x+4}{x+3}$ to solve the inequality $\frac{x+4}{x+3} \leq 0$.



a. $x = -4$

c. $-4 \leq x < 3$

b. $-4 < x < 3$

d. no solution

2. In point-form, list as many similarities/differences between the graphs of $f(x) = \frac{1}{(x-4)^2}$ and $f(x) = \frac{1}{x^2 - 4}$. Provide a rough sketch of both graphs. [3K]

3. Graph the rational function $f(x) = -\frac{x+3}{x^2 - 9}$ State the domain & range. [3K]

- $\frac{1}{x^2} = 4 \Rightarrow f(x)$
4. Solve the following equality $\frac{1}{x^2} = 4$. Show both a geometric and algebraic representation of your solution. State the domain & range. (sketch) [4T]

APPLICATION

1. Salt water flows into a large tank of pure water. The concentration of the salt in the tank at t minutes is given by the function $C(t) = \frac{6t}{10 + t}$, where c is measured in grams/liter. Graph the function and properly label the axes.
- a. At what time does the concentration in the tank reach 5 grams/liter? Provide both an algebraic and geometrical representation of your solution.

- b. At what time interval(s) is the concentration of salt less than 3 grams/litre? *Provide both an algebraic and geometrical representation of your solution.* [8A]

2. The intensity of illumination is modeled by the following function $I(d) = \frac{k}{d^2}$, where I is intensity, in lux; d is the distance, in metres, from the light source; and k is the constant. When the distance from a certain light source is 50m, the intensity is 6 lux.
- (a) Sketch a graph of this relation and properly label the axes. What is the general equation?
 - (b) Describe what happens to the light intensity as the distance away from the light source becomes greater
 - (c) Comment on the level of intensity for values of d close to 0 [8A]

THINKING

1. _____ For what values of k does the graph of $f(x) = \frac{x^2 + 16x + k}{x^2 + 7x}$ have no x -intercepts? [1T]

a. $k > 64$

c. $k > 4$

b. $k < 64$

d. $k < 4$

2. Indicate the maximum y-value of the function $f(x) = \frac{24}{x^2 + 6}$ Sketch.

[2T]

3. Determine the equation of a rational function with a vertical asymptote $x = \frac{2}{3}$, a hole at $x = 4$ and a horizontal asymptote at $y=1$ [4T]

4. Solve the following inequality (Hint: use "holla at yo boy" test #). Show both a geometric and algebraic representation of your solution. [7K]

(a) $\frac{x^2 - x - 6}{x - 2} \geq 3$

B: Geometric / Sketch

A: Algebraic