H Math 3- Unit 5 Rational Functions Homework

5.1 Synthetic Division

Directions: Use synthetic division to divide.

1. $(2x^3 + 9x^2 + 2x - 21) \div (x + 3)$
2. $(10r^3 - 22r^2 - 17r - 21) \div (r - 3)$
3. $(2n^3 + 3n^2 - 8n + 3) \div (2n - 1)$
4. $(m^3 - 13m^2 + 24m + 18) \div (m - 3)$
5. $(x^4 - 3x^3 - 11x^2 + 5x + 17) \div (x + 2)$
6. $(-2x^4 + x) \div (x - 3)$
7. $(x^2 - 16) \div (x + 4)$
8. $(-x^6 + x) \div (x - 1)$

5.2 Multiplying and Dividing Rational Expressions

Directions: Simplify the following rational expressions. State any restrictions on the variables.

1. $\dfrac{y^2-2y}{y^2+7y-18} \div \dfrac{y^2-11y+18}{y^2-81}$
2. $\dfrac{y^2-25}{y^2-16} \div \dfrac{2y+10}{y^2-4y}$
3. $\dfrac{14x+7}{4x-6} \cdot \dfrac{8x-12}{42x+21}$
4. $\dfrac{x^2}{x^2+2x+1} \div \dfrac{3x}{x^2-1}$
5. $\dfrac{2x+4}{3x-3} \cdot \dfrac{12x-12}{x+5}$
6. $\dfrac{\frac{1}{3x}}{\frac{5}{6y}}$
7. $\dfrac{x-2}{(x+2)^2} \cdot \dfrac{x+2}{2x-4}$
8. $\dfrac{5a}{5a+5} \cdot \dfrac{10a+10}{a}$
9. $\dfrac{x+6}{x^2-36}$

5.3 Adding and Subtracting Rational Expressions

Directions: Simplify the following rational expressions. State any restrictions on the variables.

1. $\dfrac{8}{3x^3y} + \dfrac{4}{9xy^3}$
2. $3x - \dfrac{x^2-5x}{x^2-2}$
3. $\dfrac{5x}{2y+4} - \dfrac{6}{y^2+2y}$
4. $\dfrac{7}{5y+25} - \dfrac{4}{3y+15}$
5. $\dfrac{7}{2xy^2} + \dfrac{3}{8x^2y}$
6. $\dfrac{6y-4}{y^2-5} + \dfrac{3y+1}{y^2-5}$
7. $\dfrac{x+2}{x^2+4x+4} + \dfrac{2}{x+2}$
8. $\dfrac{x^2}{5} + \dfrac{x^2}{5}$
9. $\dfrac{y}{4y+8} - \dfrac{1}{y^2+2y}$

5.4 Simplifying Rational Expressions

Directions: Simplify the following rational expressions. State any restrictions on the variables.

1. $\dfrac{1+\dfrac{2}{x}}{4-\dfrac{6}{x}}$

2. $\dfrac{x^2-6x}{x^2-36}\cdot\dfrac{x+6}{x^2}$

3. $-\dfrac{2}{n+4}-\dfrac{n^2}{n^2-16}$

4. $\dfrac{4}{x^2-25}+\dfrac{6}{x^2+6x+5}$

5. $\dfrac{d^2+2d-35}{d^2-10d+25}\div\dfrac{d^2-49}{d^2+d-30}$

5.5 Solving Rational Expressions

1. $\dfrac{3-x}{6}=\dfrac{6-x}{12}$

2. $\dfrac{2}{6x+2}=\dfrac{x}{3x^2+11}$

3. $\dfrac{3}{2x-4}=\dfrac{5}{3x+7}$

4. $\dfrac{2}{x+2}+\dfrac{5}{x-2}=\dfrac{6}{x^2-4}$

5. $\dfrac{7}{x^2-5x}+\dfrac{2}{x}=\dfrac{3}{2x-10}$

6. $\dfrac{1}{4-5x}=\dfrac{3}{x+9}$

7. $\dfrac{7}{2}=\dfrac{7x}{8}-4$

$4+\dfrac{2y}{y-5}=\dfrac{8}{y-5}$

5.6 Graphing Rational Functions

Directions 1-4: Identify the points of discontinuity, holes, vertical asymptotes, x-intercepts, and horizontal asymptote of each.

1. $f(x)=\dfrac{1}{3x^2+3x-18}$

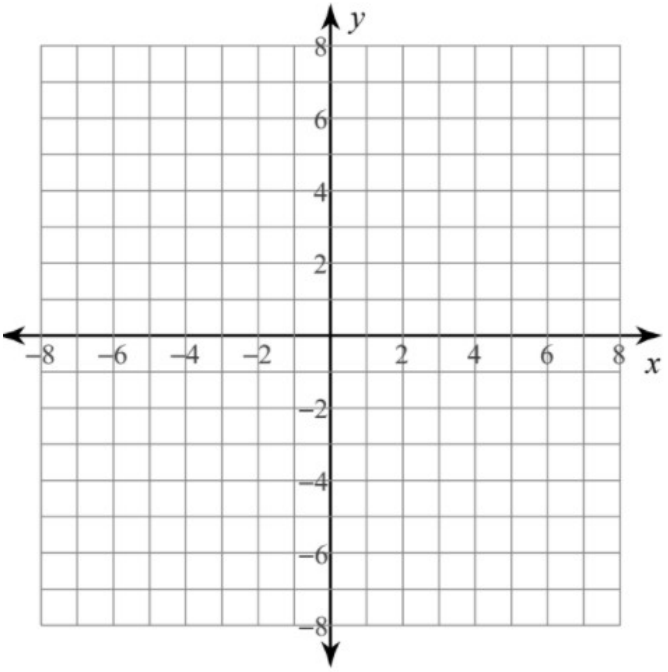
2. $f(x)=\dfrac{x-2}{x-4}$

3. $f(x)=\dfrac{x^3-x^2-6x}{-3x^2-3x+18}$

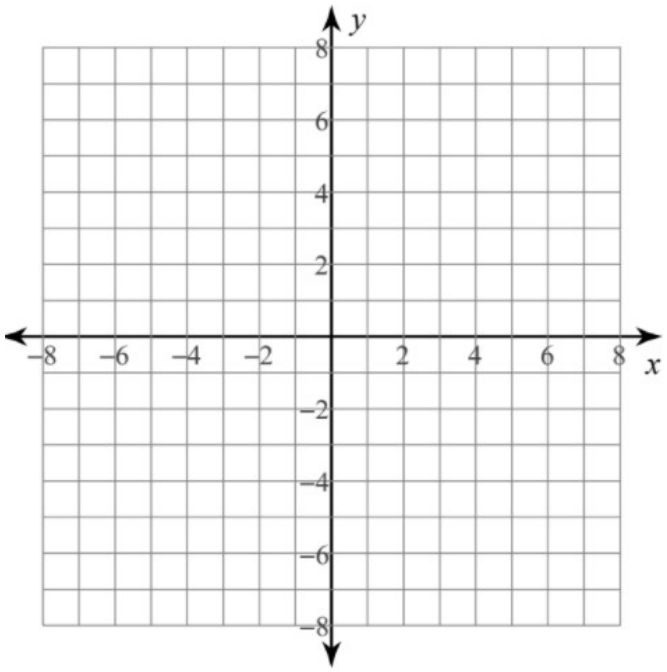
4. $f(x)=\dfrac{x^2+x-6}{-4x^2-16x-12}$

Directions 5-8: Identify the points of discontinuity, holes, vertical asymptotes, and horizontal asymptotes of each. Then sketch the graph.

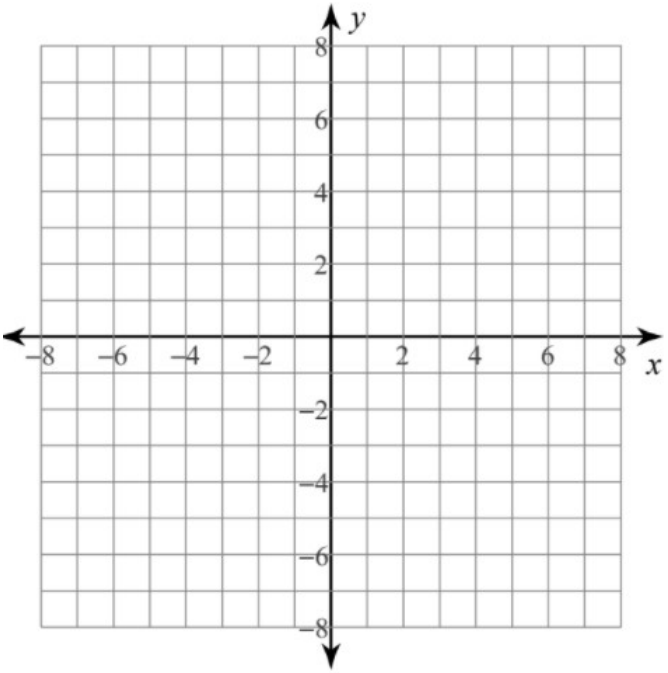
5. $f(x) = -\dfrac{4}{x^2 - 3x}$



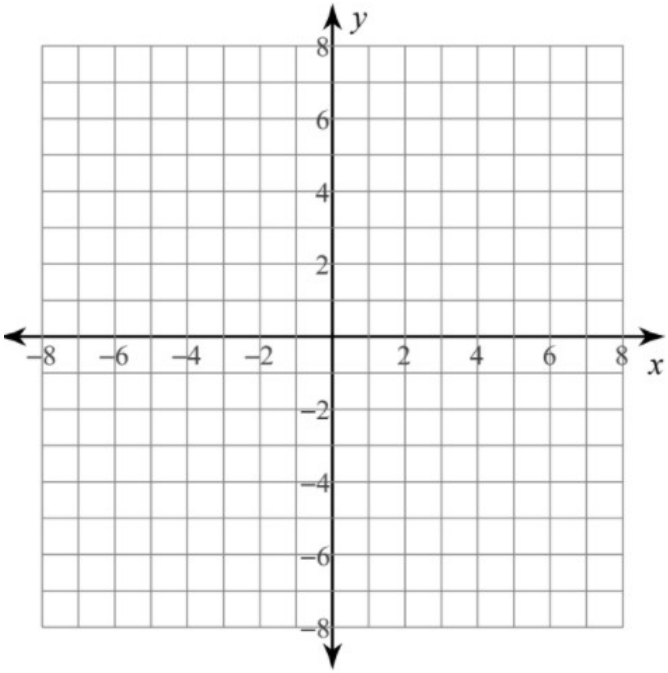
6. $f(x) = \dfrac{x-4}{-4x-16}$



7. $f(x) = \dfrac{x+4}{-2x-6}$



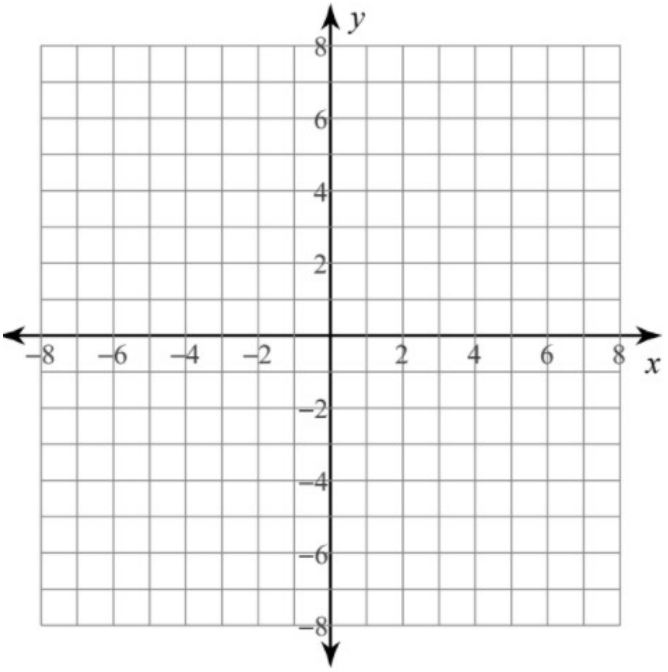
8. $f(x) = \dfrac{x^3 - 9x}{3x^2 - 6x - 9}$



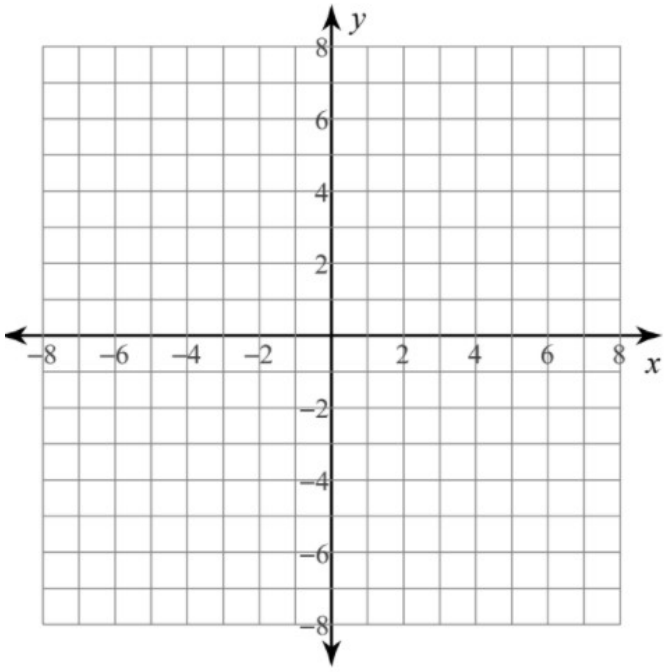
5.7 More Graphing Rational Functions

Directions 1-2: Identify the points of discontinuity, holes, vertical asymptotes, and horizontal asymptotes of each. Then sketch the graph.

1. $f(x) = \dfrac{3x^2 - 12x}{x^2 - 2x - 3}$



2. $f(x) = \dfrac{x+2}{2x+6}$



Directions 3-5: Choose the best answer choice for each problem below.

3. Which value of x will make the fraction $\dfrac{x-3}{x+6}$ undefined?

A. 6 B. −6 C. 3 D. −3

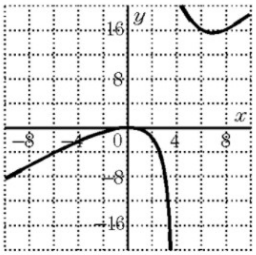
4. Which of the following is the equation of an asymptote for the function graphed?

A. $x = -4$

B. $y = 0$

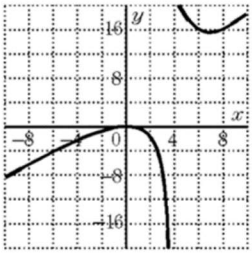
C. $x = 4$

D. $y = 16$

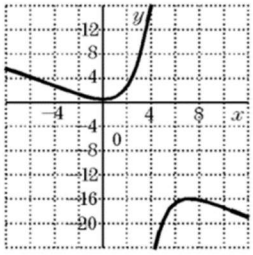


5. Which of the following represents the graph of $y = \dfrac{x^2}{x-2}$?

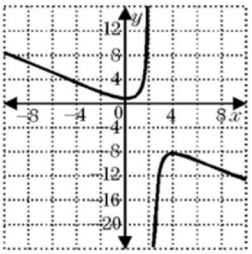
A.



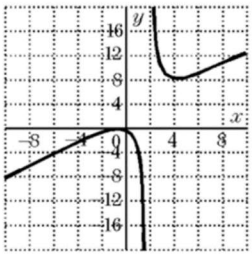
B.



C.



D.



5.8 Applications of Rational Functions

1. You can travel 40 min on your motorbike in the same time it takes your friend to travel 15 min on his bicycle. If your friend rides his bike 20 mi/hr slower than you ride your motorbike, find the speed for each bike.

2. A passenger train travels 392 mi in the same time that it takes a freight train to travel 322 mi. If the passenger train travels 20 mi/hr faster than the freight train, find the speed of each train.

3. You can paint a fence twice as fast as your sister can. Working together, the two of you can paint a fence in 6 hours. How many hours would it take each of you working alone?

4. You are planning a school field trip to a local theater. It costs $60 to rent the bus. Each theater ticket costs $5.50.

a) Write a function c(x) to represent the cost per student if x students sign up for the trip.

b) How many students must sign up if the cost is to be no more than $10 per student?

5.9 Rational Functions Review

Directions 1-2: Use synthetic division to divide.

1. $(3x^3 - 4x^2 - 17x + 6) \div (3x - 1)$

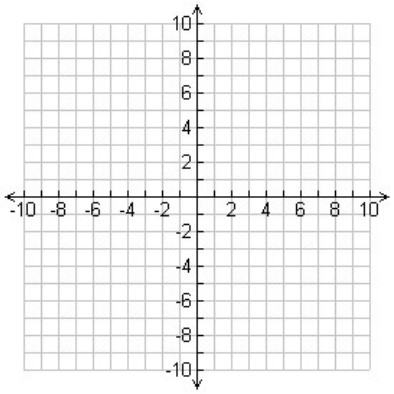
2. $(8p^5 + 32p^4 + 5p + 20) \div (p + 4)$

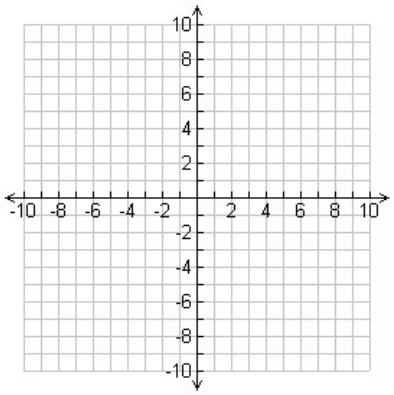
Directions: 3- 5: Sketch the asymptotes and the graph of each function. Identify the domain and range.

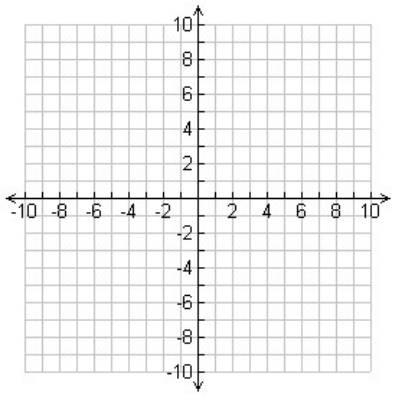
3. $y = \frac{8}{x} - 1$

4. $y = \frac{1}{x-2} + 1$

5. $y = \frac{2}{x+1}$

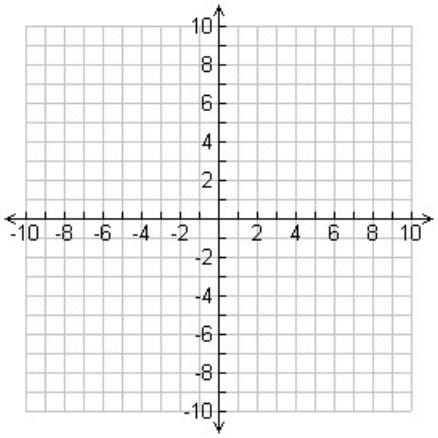




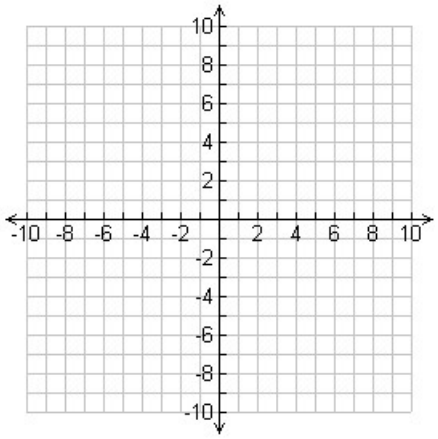


Directions 6-7: Find points of discontinuity, the domain, and x and y-intercepts of each rational function.

6. $y = \dfrac{x+3}{x^2-9}$



7. $y = \dfrac{5-x}{x^2-25}$



Directions 8-15: Simplify. State any restrictions on the variables.

8. $\dfrac{x^2+9x+18}{x+6}$

9. $\dfrac{x^2-2x-8}{x+3} \div \dfrac{x-4}{x+3}$

10. $\dfrac{2x^2+5x-3}{x^2-4x} \cdot \dfrac{2x^3-8x^2}{x^2+6x+9}$

11. $\dfrac{3x+1}{x^2-x-6} \div \dfrac{6x^2+11x+3}{x^2+4x+4}$

12. $\dfrac{6x+1}{x+2} + \dfrac{2x-5}{2x+4}$

13. $\dfrac{3x}{x^2+5x+6} - \dfrac{2x}{x^2+8x+16}$

14. $\dfrac{2}{x^2-1} - 3$

15. $\dfrac{x-3}{x^2+3x} + \dfrac{7}{x+3}$

Directions 16-17: Solve each equation. Check each solution.

16. $\dfrac{3x}{x-2} = 4 + \dfrac{x}{5}$

17. $x + \dfrac{x}{4} - \dfrac{x}{5} = 21$

18. It would take an apprentice house painter 1.5 h longer than his supervisor to paint an apartment. If they work together, they can complete the job in 4 h. About how long would it take the apprentice to complete the job working alone? Round your answer to the nearest tenth of an hour.

19. A master roofer can cover a garage in 1 h less than her new assistant. If they work together, they can complete the job in 7.75 h. How long would it take the assistant to complete the job working alone?