

## Unit 5 Test Review

For problems 1-7, use  $h(x) = \frac{x+2}{(x+2)(x-1)} = \frac{1}{x-1}$

1. State the domain.

$$(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$$

2. State the range.

$$(-\infty, 0) \cup (0, \infty)$$

3. Identify any vertical asymptotes.

$$x = 1$$

4. Identify any horizontal asymptotes.

$$y = 0$$

5. Identify any holes.

$$x = -2$$

$$\frac{1}{-2-1} = -\frac{1}{3}$$

$$\boxed{(-2, -\frac{1}{3})}$$

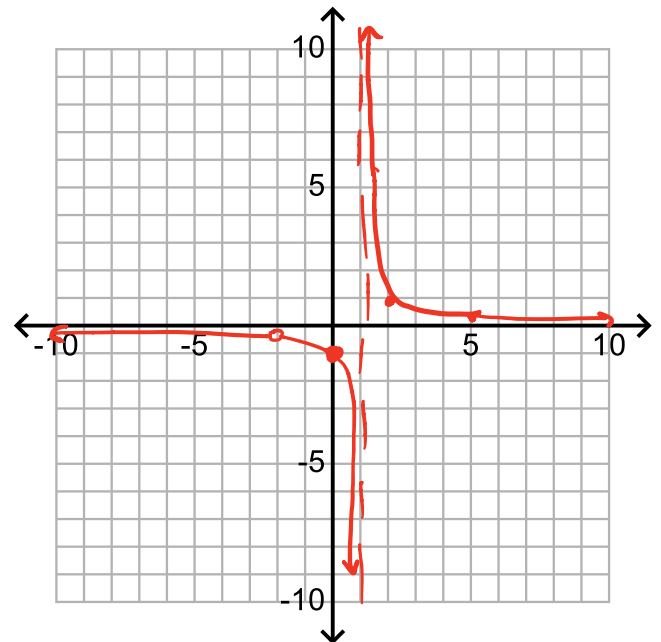
6. Identify any x-intercept(s).

None

7. Identify any y-intercepts.

$$(0, -1)$$

8. Sketch the graph of  $h$ . Show clearly all of the important features (x- and y-intercepts and asymptotes).



Plug in points

$$x = 2: h(2) = \frac{1}{2-1} = 1$$

$$x = 5: h(5) = \frac{1}{5-1} = \frac{1}{4}$$

For problems 9-16, use  $g(x) = \frac{x+4}{x^2-2x} = \frac{x+4}{x(x-2)}$

9. State the domain.

$$(-\infty, 0) \cup (0, 2) \cup (2, \infty)$$

11. Identify any vertical asymptotes.

$$x=0, x=2$$

13. Identify any holes.

None

15. Identify any y-intercepts.

None

Plug in points

$$x = -1: \frac{-1+4}{-1(-1-2)} = \frac{3}{3} = 1$$

$$x = -10: \frac{-10+4}{-10(-10-2)} = \frac{-6}{120} = -\frac{1}{20}$$

$$x = 1: \frac{1+4}{1(1-2)} = \frac{5}{-1} = -5$$

$$x = 3: \frac{3+4}{3(3-2)} = \frac{7}{3} \approx 2.3$$

10. State the range. (Do AFTER graphing)  
If it doesn't look nice, it won't be on the test!

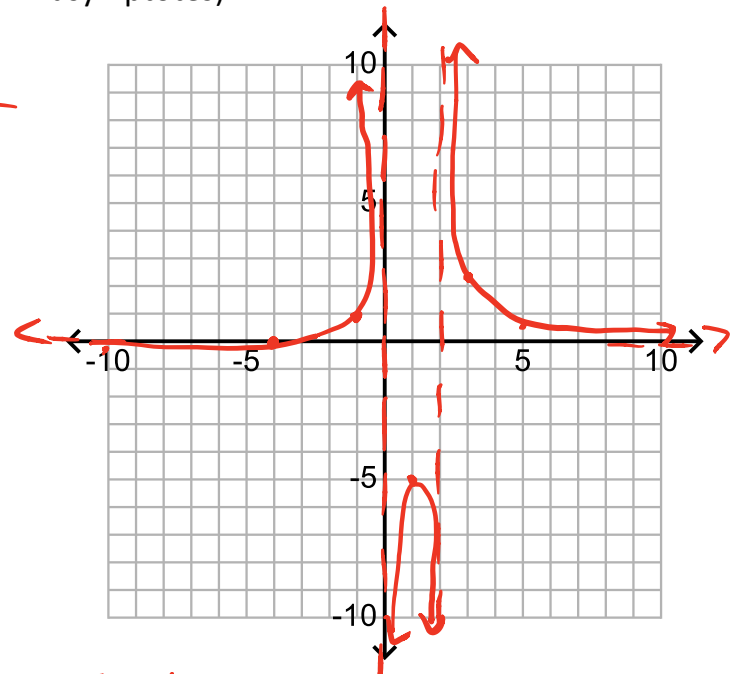
12. Identify any horizontal asymptotes.

$$y=0$$

14. Identify any x-intercept(s).

$$(-4, 0)$$

16. Sketch the graph of  $g$ . Show clearly all of the important features (x- and y-intercepts and asymptotes).



$$x=5: \frac{5+4}{5(5-2)} = \frac{9}{15} = \frac{3}{5}$$

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For questions 17-22 find all solutions to each rational equation. If no solution exists write "no solution".

$$15. \frac{5}{k-5} + \frac{k-55}{k^2-2k-15} = \frac{7}{k+3}$$

$(k+3)(k-5)$

$$5(k+3) + k - 55 = 7(k-5)$$

$$5k + 15 + k - 55 = 7k - 35$$

$$6k - 40 = 7k - 35$$

$$-6k + 35 \quad -6k + 35$$

$$\boxed{-5 = k} \quad \checkmark$$

$$D: (-\infty, -3) \cup (-3, 5) \cup (5, \infty)$$

$$17. \frac{2}{x+2} - \frac{1}{x} = \frac{-4}{x(x+2)}$$

$$2x - 1(x+2) = -4$$

$$2x - x - 2 = -4$$

$$x - 2 = -4$$

$$+2 \quad +2$$

$$\boxed{x = -2}$$

No solution

$$D: (-\infty, -2) \cup (-2, 0) \cup (0, \infty)$$

$$19. \frac{3x}{2x} + \frac{x-x}{6x} = \frac{18 \cdot 6}{x \cdot 6}$$

$$3x + x^2 = 108$$

$$x^2 + 3x - 108 = 0 \quad \frac{12x - 9}{12} = -108$$

$$\frac{12x - 9}{12} = -108$$

$$(x+12)(x-9) = 0$$

$$\boxed{x = -12, x = 9} \quad \checkmark \quad D: (-\infty, 0) \cup (0, \infty)$$

$$16. \frac{2}{x+2} + \frac{x}{x-2} = 1$$

$$2(x-2) + x(x+2) = 1(x-2)(x+2)$$

$$2x - 4 + x^2 + 2x = x^2 - 4$$

$$\frac{x^2 + 4x - 4}{-x^2} = \frac{x^2 - 4}{-x^2 + 4}$$

$$4x = 0$$

$$\boxed{x = 0} \quad \checkmark$$

$$D: (-\infty, -2) \cup (-2, 2) \cup (2, \infty)$$

$$18. \frac{7x+3}{x^2-8x+15} + \frac{3x}{x-5} = \frac{1}{3-x}$$

$$(x-5)(x-3) \quad -(x-3)$$

$$7x+3 + 3x(x-3) = -1(x-5)$$

$$7x + 3 + 3x^2 - 9x = -x + 5$$

$$3x^2 - 2x + 3 = -x + 5$$

$$+x - 5 \quad +x - 5$$

$$3x^2 - x - 2 = 0$$

$$(3x+2)(x-1) = 0 \quad -3, 2$$

$$\boxed{x = -2/3, x = 1} \quad \checkmark$$

$$D: (-\infty, 3) \cup (3, 5) \cup (5, \infty)$$

$$20. \frac{2}{x+3} - \frac{1}{x} = \frac{-6}{x(x+3)}$$

$$2x - 1(x+3) = -6$$

$$2x - x - 3 = -6$$

$$x - 3 = -6$$

$$\boxed{x = -3}$$

No solution

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$$D: (-\infty, -3) \cup (-3, 0) \cup (0, \infty)$$

21. You ride your bike to a store, 3 miles away, to pick up things for dinner. When there is no wind, you ride at 9 mi/hr. Today your trip to the store and back took you 1 hour. What was the speed of the wind today?

	D	R	T
With wind	3	$9+x$	$\frac{3}{9+x}$
Against wind	3	$9-x$	$\frac{3}{9-x}$

$$\frac{3}{9+x} + \frac{3}{9-x} = 1 \rightarrow 3(9-x) + 3(9+x) = 1(9-x)(9+x)$$

$$27 - 3x + 27 + 3x = 81 - x^2$$

$$x^2 = 54 \rightarrow x \approx \boxed{7.35 \text{ mph}}$$

22. On the first four tests of the term your average test score was 75%. You think you can score 93% on each of the remaining tests. How many consecutive test scores of 93% would you need to bring your average up to 90% for the term?

$75 = \frac{x}{4}$   
 $x = 300$   
 (x = sum of first 4 scores)

(y = # of tests)

$$90 = \frac{300 + 93y}{4 + y}$$

$$90(4+y) = 300 + 93y$$

$$360 + 90y = 300 + 93y$$

$$60 = 3y$$

$$y = \boxed{20 \text{ tests}}$$

23. A plane flies 910 miles with the wind in the same time it can go 660 miles against the wind. The speed of the plane in still air is 305 miles per hour. What is the speed of the wind?

	D	R	T
with	910	$305+x$	$\frac{910}{305+x}$
Against	660	$305-x$	$\frac{660}{305-x}$

$$\frac{910}{305+x} = \frac{660}{305-x}$$

$$910(305-x) = 660(305+x)$$

$$277550 - 910x = 201300 + 660x$$

$$76250 = 1570x$$

$$x = \boxed{76.25 \text{ mph}}$$

24. A person swims 11 miles downriver in the same time they can swim 7 miles upriver. The speed of the current is 4 miles per hour. Find the speed of the person in still water.

	D	R	T
Down	11	$x + 4$	$\frac{11}{x+4}$
up	7	$x - 4$	$\frac{7}{x-4}$

$$\frac{11}{x+4} = \frac{7}{x-4}$$

$$11(x-4) = 7(x+4)$$

$$11x - 44 = 7x + 28$$

$$\begin{array}{r} 11x - 44 = 7x + 28 \\ -7x \quad +44 \quad -7x \quad +44 \\ \hline 4x = 72 \end{array}$$

$$x = 18 \text{ mph}$$

25. Kent can paint a certain room in 6 hours, but Kendra needs 4 hours to paint the same room. How long does it take them to paint the room if they work together?

$$\frac{2x}{2x} \cdot \frac{1}{6} + \frac{1}{4} \cdot \frac{3x}{3x} = \frac{1}{x} \cdot \frac{12}{12}$$

$$2x + 3x = 12$$

$$5x = 12$$

$$x = \frac{12}{5} = 2.4 \text{ hr}$$

26. Marco can build a lap top twice as fast as Cliff. Working together, it takes them 5 hours. How long would it have taken Marco working alone?

$$\frac{10}{10} \cdot \frac{1}{x} + \frac{1}{2x} \cdot \frac{5}{5} = \frac{1}{5} \cdot \frac{2x}{2x}$$

$$10 + 5 = 2x$$

$$\frac{15}{2} = \frac{2x}{2}$$

$$\rightarrow x = 7.5 \text{ hr}$$

27. It takes you 30 minutes to rake the leaves in your yard and it takes your brother 45 minutes. How long does it take the two of you to rake the leaves when working together?

$$\frac{3x}{3x} \cdot \frac{1}{30} + \frac{1}{45} \cdot \frac{2x}{2x} = \frac{1}{x} \cdot \frac{90}{90}$$

$$3x + 2x = 90$$

$$5x = 90$$

$$x = 18 \text{ min}$$

28. You paint 2 square yards of a community mural in 3 hours and a friend paints 4 square yards in 5 hours. How long does it take the two of you to paint 11 square yards when working together?

$$\frac{5x}{5x} \cdot \frac{2}{3} + \frac{4}{5} \cdot \frac{3x}{3x} = \frac{11}{x} \cdot \frac{15}{15}$$

$$10x + 12x = 165$$

$$\begin{array}{r} 22x = 165 \\ \hline 22 \quad 22 \end{array}$$

$$x = 7.5 \text{ hr}$$