Name _____ Date _____

Chapter 7
Form A

For problems 1 – 2, find all numbers for which each rational expression in undefined. If the rational expression is defined for all real numbers, so state.

1. $\dfrac{x+1}{x+5}$ 1. _____

2. $\dfrac{3x}{x^2+6x+5}$ 2. _____

For problems 3 – 5, simplify each rational expression. If the rational expression cannot be simplified, so state.

3. $\dfrac{40x^5}{15x^2}$ 3. _____

4. $\dfrac{x^2-1}{x^2-4x-5}$ 4. _____

5. $\dfrac{4x^2-y^2}{y-2x}$ 5. _____

For problems 6 – 12, perform the indicated operations. Simplify the result, if possible.

6. $\dfrac{x+4}{2x}\cdot\dfrac{6x^2}{x^2-16}$ 6. _____

7. $\dfrac{y^2-4y+3}{y^2-9}\cdot\dfrac{4y+12}{y^2-2y+1}$ 7. _____

8. $\dfrac{x+2}{x^2-1}\div\dfrac{x^2+4x+4}{x^2-3x+2}$ 8. _____

9. $\dfrac{x^2+x}{x^2-6x+8}\div\dfrac{x^2+3x+2}{2x^2-7x+6}$ 9. _____

10. $\dfrac{7x+4}{2x-1}-\dfrac{5x+3}{2x-1}$ 10. _____

11. $\dfrac{4}{y-5}+\dfrac{2}{y}$ 11. _____

Name _____ Date _____

12. $\dfrac{3}{x^2-5x+6}-\dfrac{2}{x^2-9}$ 12. _____

For problems 13 – 14, simplify each complex rational expression.

13. $\dfrac{\frac{1}{x}-\frac{1}{y}}{\frac{1}{x}}$ 13. _____

14. $\dfrac{2+\frac{4}{x}}{1-\frac{4}{x^2}}$ 14. _____

For problems 15 – 16, solve each rational equation. If an equation has no solution, so state.

15. $\dfrac{2}{3x}+\dfrac{1}{x}=\dfrac{1}{6}$ 15. _____

16. $\dfrac{1}{x+4}-\dfrac{1}{x-2}=\dfrac{x+2}{x^2+2x-8}$ 16. _____

17. Solve for s: $R=\dfrac{as}{a+s}$ 17. _____

18. The formula for the total resistance, R, in a parallel circuit is $\dfrac{1}{R}=\dfrac{1}{r_1}+\dfrac{1}{r_2}$ where r_1 is the resistance of the first resistor and r_2 is the resistance of the second resistor in ohms. If r_1 is 5 ohms and r_2 is 10 ohms, what is the total resistance, R, of the parallel circuit? 18. _____

19. A boat travels 30 miles upstream against the current in the same amount of time it takes to travel 42 miles downstream with the current. If the rate of the current is 4 mph, what is the rate of the boat in still water? 19. _____

20. The intensity of a light source varies inversely with the square of the distance from the source. The intensity is 8 foot-candles at a distance of 2 feet. At what distance is the intensity 2 foot-candles? 20. _____

Form A

1. -5 2. $-1, -5$ 3. $\frac{8x^3}{3}$ 4. $\frac{x-1}{x-5}$ 5. $-2x-7$ 6. $\frac{3x}{x-4}$ 7. $\frac{4}{y-1}$ 8. $\frac{x-2}{(x+1)(x+2)}$

9. $\frac{x(2x-3)}{(x-4)(x+2)}$ 10. $\frac{2x+1}{2x-1}$ 11. $\frac{2(3y-5)}{y-5}$ 12. $\frac{x+13}{(x+3)(x-3)(x-2)}$ 13. $\frac{y-x}{y}$

14. $\frac{2x}{x-2}$ 15. 10 16. -8 17. $s=\frac{Ra}{a-R}$ 18. $\frac{10}{3}$ ohms 19. 24 mph 20. 4 feet

(1) $x+5=0$

$x+5-5=0-5$

$\boxed{x=-5}$

(2) $x^2+6x+5=0$

$(x+5)(x+1)=0$

$x+5=0$ or $x+1=0$

$x+5-5=0-5$ or $x+1-1=0-1$

$\boxed{x=-5 \text{ or } x=-1}$

(3) $\frac{40x^5 \div 5x^2}{15x^2 \div 5x^2}$

$= \boxed{\frac{8x^3}{3}}$

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

$= \boxed{\frac{x-1}{x-5}}$

(5) $\frac{4x^2-y^2}{y-2x} = \frac{(2x-y)(2x+y)}{-(2x-y)}$

$= \frac{2x+y}{-1} = \boxed{-2x-7}$

(6) $\frac{x+4}{2x} \cdot \frac{6x^2}{x^2-16} = \frac{^{3}6x^{\cancel{2}}(x+4)}{2x(x+4)(x-4)}$

$= \boxed{\frac{3x}{x-4}}$

(7) $\frac{(y-3)(y-1) \cdot 4(y+3)}{(y-3)(y+3)(y-1)(y-1)}$

$= \boxed{\frac{4}{y-1}}$

(8) $\frac{x+2}{x^2-1} \cdot \frac{x^2-3x+2}{x^2+4x+4}$

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

$= \boxed{\frac{x-2}{(x+1)(x+2)}}$

(9) $\frac{x^2+x}{x^2-6x+8} \cdot \frac{2x^2-7x+6}{x^2+3x+2}$

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

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

(10) $\frac{(7x+4)-(5x+3)}{2x-1}$

$= \frac{7x+4+-5x+-3}{2x-1}$

$= \boxed{\frac{2x+1}{2x-1}}$

(11) $\frac{4}{y-5} + \frac{2}{y}$ LCD $= y(y-5)$

$= \frac{4}{y-5} \cdot \frac{y}{y} + \frac{2}{y} \cdot \frac{(y-5)}{(y-5)}$

$= \frac{4y+2(y-5)}{y(y-5)}$

$= \frac{4y+2y-10}{y(y-5)} = \boxed{\frac{6y-10}{y(y-5)} \text{ or } \frac{2(3y-5)}{y(y-5)}}$

(12) $\frac{3}{(x-2)(x-3)} - \frac{2}{(x-3)(x+3)}$

$[\text{LCD} = (x-2)(x-3)(x+3)]$

$= \frac{3}{(x-2)(x-3)} \cdot \frac{(x+3)}{(x+3)} - \frac{2}{(x-3)(x+3)} \cdot \frac{(x-2)}{(x-2)}$

$= \frac{3x+9-2x+4}{(x-2)(x-3)(x+3)} = \boxed{\frac{x+13}{(x-2)(x-3)(x+3)}}$

(13) $\dfrac{\frac{1}{x}-\frac{1}{y}}{\frac{1}{x}} \cdot \dfrac{\frac{xy}{1}}{\frac{xy}{1}}$

$= \dfrac{\frac{1}{x}\cdot\frac{xy}{1} - \frac{1}{y}\cdot\frac{xy}{1}}{\frac{1}{x}\cdot\frac{xy}{1}}$

$= \dfrac{y-x}{y} = \dfrac{y}{y} - \dfrac{x}{y}$

$= \boxed{1 - \frac{x}{y} \quad \text{or} \quad \frac{y-x}{y}}$

(14) $\dfrac{2+\frac{4}{x}}{1-\frac{4}{x^2}} \cdot \dfrac{\frac{x^2}{1}}{\frac{x^2}{1}}$

$= \dfrac{\frac{2}{1}\cdot\frac{x^2}{1} + \frac{4}{x}\cdot\frac{x^2}{1}}{1\cdot\frac{x^2}{1} - \frac{4}{x^2}\cdot\frac{x^2}{1}}$

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

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

(15) $\dfrac{2}{3x} + \dfrac{1}{x} = \dfrac{1}{6}$

LCD $= 6x$

$\frac{6x}{1}\left(\frac{2}{3x} + \frac{1}{x}\right) = \frac{6x}{1}\cdot\frac{1}{6}$

$4 + 6 = x$

$\boxed{x = 10}$

(16) $\dfrac{1}{x+4} - \dfrac{1}{x-2} = \dfrac{x+2}{(x+4)(x-2)}$

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

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

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

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

$-6 = x + 2$

$-2 \quad -2$

$\boxed{-8 = x}$

(17) $R = \dfrac{as}{a+s}$

$(a+s)\cdot R = \dfrac{as}{a+s}\cdot(a+s)$

$aR + sR = as$ distribute

$-sR \quad -sR$

$aR = as - sR$

$aR = sa - sR$ ↘ since $as = sa$

$sa - sR = aR$ ↘ Interchange left & rt. hand sides.

$s(a-R) = aR$ ↘ factor s

$\dfrac{s(a-R)}{a-R} = \dfrac{aR}{a-R}$ ↘ divide

$s = \dfrac{aR}{a-R}$

(18) $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$

$\frac{1}{R} = \frac{1}{5} + \frac{1}{10}$; LCD = 10R

$\frac{10R}{1} \cdot \frac{1}{R} = \frac{10R}{1} \cdot \frac{1}{5} + \frac{10R}{1} \cdot \frac{1}{10}$

$10 = 2R + R$

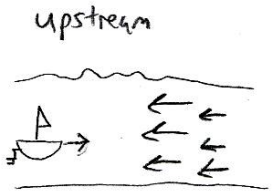
$10 = 3R$

$3R = 10$

$\frac{3R}{3} = \frac{10}{3}$

$\boxed{R = \frac{10}{3}}$

(19)



current speed 4 mph ; let r = speed of boat in still water

D	d	r	$t = \frac{d}{r}$
upstream	30	r − 4	30/(r−4)
downstream	42	r + 4	42/(r+4)

Time is the same for both legs of the trip. This suggests we solve $\frac{30}{r-4} = \frac{42}{r+4}$

$42(r-4) = 30(r+4)$

$42r - 168 = 30r + 120$

$-30r + 168 \quad -30r + 168$

$12r + 0 = 0 + 288$

$\frac{12r}{12} = \frac{288}{12}$; so $\boxed{r = 24 \text{ mph}}$

(20) $I = \frac{k}{d^2}$ and when $d = 2$ ft, $I = 8$ ft. candles

Therefore, $8 = \frac{k}{2^2}$ or $8 = \frac{k}{4}$ or $8 \cdot 4 = k$, or $k = 32$.

So, $\boxed{I = \frac{32}{d^2}}$ is used to predict what d is when $I = 2$.

$2 = \frac{32}{d^2}$ multiply by d^2

$2d^2 = \frac{d^2}{1} \cdot \frac{32}{d^2}$

$2d^2 = 32$

$\frac{2d^2}{2} = \frac{32}{2}$

$d^2 = 16$

$\boxed{d = 4 \text{ feet}}$