Name _____ **9.4 Practice** (pg 501)

Simplify each rational expression.

1) $\frac{2x}{4x^2-2x}$ $\frac{2x}{2x(2x-1)} = \frac{1}{2x-1}$ $x \neq 0$

2) $\frac{6c^2+9c}{3c}$ $\frac{3c(2c+3)}{3c}$ $2c+3$ $c \neq 0$

3) $\frac{b^2-1}{b-1}$ $\frac{(b-1)(b+1)}{b-1}$ $b+1$ $b \neq 1$

6) $\frac{x^2+8x+16}{x^2-2x-24} = \frac{(x+4)(x+4)}{(x-6)(x+4)} = \frac{x+4}{x-6}$ $x \neq -4$

Multiply.

8) $\frac{2x^4}{10y^2} \cdot \frac{5y^3}{4x^3} = \frac{xy}{4}$ $x \neq 0$, $y \neq 0$

9) $\frac{4(2y-1)}{8y-4} \cdot \frac{5(y-3)}{5y-15} = \frac{20}{15} = \frac{4}{3}$

12) $\frac{(x-3)(x-2)}{x^2-5x+6} \cdot \frac{(x+2)(x+1)}{x^2+3x+2} = 1$

Divide.

13) $\frac{7x}{4y^3} \div \frac{21x^3}{8y}$ $\frac{7x}{4y^3} \cdot \frac{8y}{21x^3} = \frac{2}{3x^2y^2}$

15) $\frac{6x+6y}{x-y} \div \frac{18}{5x-5y}$ $\frac{6(x+y)}{x-y} \cdot \frac{5(x-y)}{18} = \frac{5(x+y)}{3}$ $x \neq y$

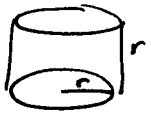
18) $\frac{y^2-5y+6}{4y^3} \div \frac{y^2+3y-10}{4y^2}$ $\frac{(y-3)(y-2)}{4y^3} \cdot \frac{4y^2}{(y+5)(y-2)} = \frac{y-3}{y(y+5)}$ $y \neq 2$

Simplify the rational expression.

21) $\dfrac{xy^3 - 9xy}{12xy^2 + 12xy - 144x} \Rightarrow \dfrac{xy(y^2-9)}{12x(y^2+y-12)} = \dfrac{xy(y-3)(y+3)}{12x(y+4)(y-3)} = \dfrac{y(y+3)}{12(y+4)}$

$y \neq 3$
$x \neq 0$

26) **Industrial Design** A storage tank will have a circular base of radius r and a height of r. The tank can be either cylindrical or hemispherical.



a. Write and simplify an expression for the ratio of the volume of the hemispherical tank to its surface area (including the base). For a sphere, $V = \frac{4}{3}\pi r^3$ and $SA = 4\pi r^2$.

Hemi $\frac{2}{3}\pi r^3$ ↓ Hemi $2\pi r^2 + \pi r^2$ BASE

$\dfrac{\frac{2}{3}\pi r^3}{2\pi r^2 + \pi r^2} = \dfrac{2\pi r^3}{3(3\pi r^2)} = \dfrac{2r}{9}$

b. Write and simplify an expression for the ratio of the volume of the cylindrical tank to its surface area (including the base).

$\dfrac{V}{SA} = \dfrac{\pi r^2 \cdot r}{2\pi r \cdot r + 2\pi r^2} = \dfrac{\pi r^3}{4\pi r^2} = \dfrac{r}{4}$

c. Compare the ratios of volume to surface area for the two tanks.

Hemi : $\dfrac{\frac{2r}{9}}{\frac{r}{4}} = \dfrac{2r}{9} \cdot \dfrac{4}{r} = \dfrac{8}{9}$ ← ratio of Vol : SA of a cylinder is always larger than ratio of Vol : SA of a hemisphere with same radius & height

Cyl :

d. Compare the volumes of the two tanks.

$\dfrac{\frac{2}{3}\pi r^3}{\pi r^3} = \dfrac{2}{3}$ ← cylinder will always have a larger vol. than hemisphere w/ same rad & height

Multiply or divide.

29) $\dfrac{6x^3 - 6x^2}{x^4 + 5x^3} \div \dfrac{3x^2 - 15x + 12}{2x^2 + 2x - 40}$

$\dfrac{6x^2(x-1)}{x^3(x+5)} \cdot \dfrac{2(x^2+x-20)}{3(x^2-5x+4)}$ $\quad (x+5)(x-4)$ $\quad (x-4)(x-1)$

$\dfrac{4}{x}$ $\quad x \neq 1, 0, 4, -5$

31) $\dfrac{x^2 - x - 2}{2x^2 - 5x + 2} \div \dfrac{x^2 - x - 12}{2x^2 + 5x - 3}$

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

$\dfrac{x+1}{x-4}$ $\quad x \neq 2, \frac{1}{2}, -3$

Simplify.

33) $\dfrac{(x^2-x)^2}{x(x-1)^{-2}(x^2+3x-4)} = \dfrac{(x^2-x)^2(x-1)^2}{x(x^2+3x-4)} = \dfrac{x^2(x-1)^2(x-1)^2}{x(x+4)(x-1)} = \dfrac{x(x-1)^3}{x+4}$ $x\neq 0,1$

38) a. Simplify $\dfrac{(2x^n)^2-1}{2x^n-1} = \dfrac{[(2x^n)-1][(2x^n)+1]}{2x^n-1} = 2x^n+1$

$2x^n-1\neq 0$, $2x^n\neq 1$, $x^n\neq \frac{1}{2}$

b. Use the results from part (a) to show the value of the given expression is always an odd integer, if x is an integer and n is a positive integer.

$2x^n$ must be even (if x^n is an integer) since it is a multiple of 2.
Since x is an integer and n is a pos. integer, x^n is an integer.
$2x^n+1$ must be odd since it is not a multiple of 2.

Looking ahead…..

Simplify:

39) $\dfrac{\frac{8x^2y}{x+1}}{\frac{6xy^2}{x+1}}$

$\dfrac{8x^2y}{x+1}\cdot\dfrac{x+1}{6xy^2} = \dfrac{4x}{3y}$ $x\neq -1,0$

40) $\dfrac{\frac{3a^3b^3}{a-b}}{\frac{4ab}{b-a}}$

$\dfrac{3a^3b^3}{a-b}\cdot\dfrac{b-a}{4ab} = \dfrac{-3a^2b^2}{4}$ $a\neq b$, $a\neq 0$, $b\neq 0$

41) $\dfrac{\frac{9m+6n}{m^2n^2}}{\frac{12m+8n}{5m^2}}$

$\dfrac{9m+6n}{m^2n^2}\cdot\dfrac{5m^2}{12m+8n}$

$\dfrac{3(3m+2n)}{m^2n^2}\cdot\dfrac{5m^2}{4(3m+2n)} = \dfrac{15}{4n^2}$ $3m+2n\neq 0$, $m\neq 0$