Simplifying Rational Expressions

1. Simplify.

a. $\dfrac{36xy}{9x}$ *b.* $\dfrac{84x^2y^2}{20xy}$

c. $\dfrac{-50xy^3}{-20x^2y}$ *d.* $\dfrac{\left(3xy^2\right)^2}{27x^3y}$

e. $\dfrac{(-3xy)\left(5x^2y\right)}{(5xy)^2}$ *f.* $\dfrac{\left(2x^2y\right)\left(-8xy^3\right)}{(-4xy)^2}$

2. Simplify. State the restrictions on the variable if they exist.

a. $\dfrac{3x+27}{3}$ *b.* $\dfrac{6x+54}{3}$

c. $\dfrac{5x^2-125x}{10x}$ *d.* $\dfrac{26x^2y^3-48xy^2}{4xy}$

e. $\dfrac{18xy^2-24x^2y^3+12x^2y}{6xy}$ *f.* $\dfrac{7ab^2-21a^2b^3-49a^2b^4}{28a^2b^2}$

3. Simplify each of the following for all permissible values of x. State the restrictions on the variable if they exist.

a. $\dfrac{2(x-5)(x+1)}{4(x+1)}$ *b.* $\dfrac{8(x-6)(x-6)}{(6-x)}$

c. $\dfrac{10x(x+4)}{5x^2(x-4)}$ *d.* $\dfrac{3x}{3x-18}$

e. $\dfrac{7x^2-21x}{x-3}$ *f.* $\dfrac{4x-12}{2(x-3)(x+3)}$

g. $\dfrac{6x+12y}{2x+4y}$ *h.* $\dfrac{4-5x}{15x-12}$

i. $\dfrac{8xy+10x}{16y+20}$ *j.* $\dfrac{3x^2-6x}{9x-18}$

4. Simplify each of the following for all permissible values of x.

a. $\dfrac{x+4}{x^2+3x-4}$

b. $\dfrac{x^2-7x-30}{x-10}$

c. $\dfrac{x^2-12x+35}{2x-14}$

d. $\dfrac{x^2+18x+81}{x^2-81}$

e. $\dfrac{2x^2-5x-25}{6x+15}$

f. $\dfrac{x^2-10x+21}{x^2+4x-21}$

g. $\dfrac{x^2-2x-24}{x^2-16}$

h. $\dfrac{x^2-17x+30}{x^2-13x-30}$

i. $\dfrac{2x^2+16x-66}{4x^2+48x+44}$

j. $\dfrac{15x^2+4x-3}{25x^2-9}$

k. $\dfrac{9x^2-30xy+25y^2}{3x^2+16xy-35y^2}$

l. $\dfrac{49x^2+50x+1}{4x^2-5x-9}$

5. Simplify each of the following for all permissible values of x.

a. $\dfrac{15x^2+4}{15x^2-4}$

b. $\dfrac{15x^2+4}{4+15x^2}$

c. $\dfrac{x^3-x^2-6x}{2x^2-x-15}$

d. $\dfrac{(x+y)^3}{x^2-y^2}$

d. $\dfrac{(x+y)^5}{(x+y)^3}$

f. $\dfrac{(2x-2y)^5}{2x-2y}$

6. Simplify each of the following for all permissible values of x.
   State the restrictions on the variable if they exist.

a. $\dfrac{x^3-8}{x^2-4x+4}$ *b.* $\dfrac{27x^3-64}{9x^2-24x+16}$

c. $\dfrac{64x^6-729y^6}{2x^2-xy-3y^2}$ *d.* $\dfrac{x^4-15x^2-16}{x^2+5x+4}$

e. $\dfrac{x^4-1}{x^2-1}$ *f.* $\dfrac{x^4-9x^2+20}{x^4-16}$

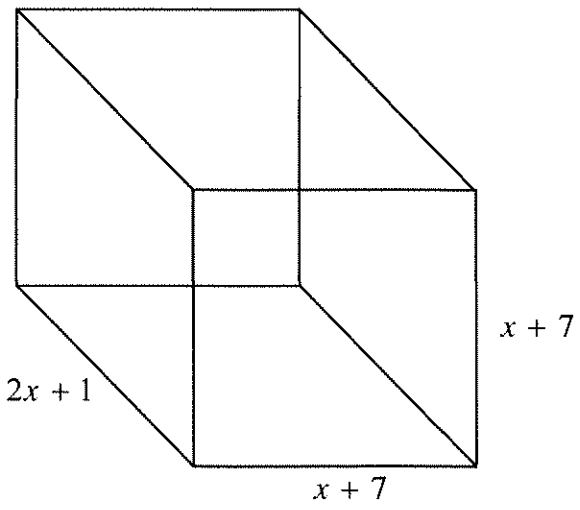
7. Find a value for k that makes the following rational expressions true.

a. $\dfrac{2x^2-5x+k}{3x^2-11x-4} = \dfrac{2x+3}{3x+1}$

b. $\dfrac{5x^2+11x+k}{x^2-4} = \dfrac{5x+1}{x-2}$

c. $\dfrac{4x^2-49}{8x^2+26x-k} = \dfrac{2x-7}{4x-1}$

8. Given the following rectangular prism, find an expression for the ratio of the volume to the surface area.



ANSWERS

1*a*. $4y$

1*b*. $\frac{21xy}{5}$

1*c*. $\frac{5y^2}{2x}$

1*d*. $\frac{y^3}{3x}$

1*e*. $\frac{-3x}{5}$

1*f*. $-xy^2$

2*a*. $x+9$, *no restrictions*

2*b*. $2(x+9)$, *no restrictions*

2*c*. $\frac{x-25}{2}$, $x \neq 0$

2*d*. $\frac{y(13xy-24)}{2}$, $x \neq 0$, $y \neq 0$

2*e*. $3y-4xy^2+2x$, $x \neq 0$, $y \neq 0$

2*f*. $\frac{1-3ab-7ab^2}{4a}$, $a \neq 0$, $b \neq 0$

3*a*. $\frac{x-5}{2}$, $x \neq -1$

3*b*. $-8(x-6)$, $x \neq 6$

3*c*. $\frac{2(x+4)}{x(x-4)}$, $x \neq 0$, , $x \neq 4$

3*d*. $\frac{x}{x-6}$, $x \neq 6$

3*e*. $7x$, $x \neq 3$

3*f*. $\frac{2}{x+3}$, $x \neq \pm 3$

3*g*. 3, $x \neq -2y$, $y \neq -\frac{1}{2}x$

3*h*. $-\frac{1}{3}$, $x \neq \frac{4}{5}$

3*i*. $\frac{x}{2}$, $y \neq -\frac{5}{4}$

3*j*. $\frac{x}{3}$, $x \neq 2$

4*a*. $\frac{1}{x-1}$

4*b*. $x+3$

4*c*. $\frac{x-5}{2}$

4*d*. $\frac{x+9}{x-9}$

4*e*. $\frac{x-5}{3}$

4*f*. $\frac{x-7}{x+7}$

4*g*. $\frac{x-6}{x-4}$

4*h*. $\frac{x-2}{x+2}$

4*i*. $\frac{x-3}{2(x+1)}$

4*j*. $\frac{3x-1}{5x-3}$

4*k*. $\frac{3x-5y}{x+7y}$

4*l*. $\frac{49x+1}{4x-9}$

5a. $\dfrac{15x^2 + 4}{15x^2 - 4}$

5b. 1

5c. $\dfrac{x(x + 2)}{2x + 5}$

5d. $\dfrac{(x + y)(x + y)}{x - y}$

5e. $(x + y)^2$

5f. $(2x - 2y)^4$

6a. $\dfrac{\left(x^2 + 2x + 4\right)}{x - 2}$, $x \neq 2$

6b. $\dfrac{9x^2 + 12x + 16}{3x - 4}$, $x \neq \dfrac{4}{3}$

6c. $\dfrac{(2x + 3y)\left(16x^4 + 36x^2y^2 + 81y^4\right)}{x + y}$, $x \neq \dfrac{3}{2}y$, $y \neq \dfrac{2}{3}x$, $x \neq y$

6d. $\dfrac{(x - 4)\left(x^2 + 1\right)}{x + 1}$, $x \neq -1$, $x \neq -4$

6e. $x^2 + 1$, $x \neq \pm 1$

6f. $\dfrac{x^2 - 5}{x^2 + 4}$, $x \neq \pm 2$

7a. $k = -12$

7b. $k = 2$

7c. $k = 7$

8. $\dfrac{(2x+1)(x+7)}{2(5x+9)}$