2.2 Multiplication and Division of Rational Expressions

Solutions

Multiply and simplify.

1.

$$\frac{16x^2}{y^4}\cdot\frac{5x^2}{4y^2}$$

$$=\frac{^{4}\cancel{16}\cdot 5\cdot x^2\cdot x^2}{\cancel{4}\cdot y^4\cdot y^2}$$

$$=\frac{20x^4}{y^6}$$

2.

$$\frac{12x^3y}{6xy^5}\cdot\frac{5xy^2}{25x^4y^4}$$

3.

$$\frac{3a^2}{a+2}\cdot\frac{a^2-4}{3a}$$

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

$$=a(a-2)$$

4.

$$\frac{y-1}{4y}\cdot\frac{8y^2-16y}{3-3y}$$

5.

$$\frac{x-4}{3-x}\cdot\frac{x-3}{3x-12}$$

$$=\frac{\cancel{x-4}}{-(\cancel{x-3})}\cdot\frac{\cancel{x-3}}{3(\cancel{x-4})}$$

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

6.

$$\frac{x^2-4}{3x+12}\cdot\frac{x+4}{2-x}$$

Answers: **1.** $\frac{20x^4}{y^6}$; **3.** $a(a-2)$; **5.** $-\frac{1}{3}$

Multiply and simplify.

7.

$$\frac{x^2+5x+6}{x^2-5x-14}\cdot\frac{x^2-3x-28}{x^2+4x+3}$$

$$=\frac{(x+2)(x+3)}{(x+2)(x-7)}\cdot\frac{(x-7)(x+4)}{(x+3)(x+1)}$$

$$=\frac{x+4}{x+1}$$

8.

9.

$$\frac{2y^2-5y-12}{4y^2+8y+3}\cdot\frac{2y^2+7y+3}{y^2-16}$$

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

$$=\frac{y+3}{y+4}$$

10.

$$\frac{x^2-7x+12}{x^2+2x-15}\cdot\frac{x^2-25}{x^2-16}$$

Answers: **7.** $\frac{x+4}{x+1}$; **9.** $\frac{y+3}{y+4}$

Divide and simplify.

11.

$$\frac{9x^3}{4} \div \frac{3}{16y^2} = \frac{9x^3}{4} \cdot \frac{16y^2}{3}$$

$$= \frac{{}^{3}\cancel{9}x^3}{\cancel{4}} \cdot \frac{{}^{4}16y^2}{\cancel{3}}$$

$$= 12x^3y^2$$

12.

$$\frac{12x^8}{3y^4} \div \frac{16x^3}{6y}$$

13.

$$\frac{y^2+2y}{6y} \div \frac{y^2-4}{3y^2} = \frac{y^2+2y}{6y} \cdot \frac{3y^2}{y^2-4}$$

$$= \frac{\cancel{y}(y+2)}{{}_{2}\cancel{6}\,\cancel{y}} \cdot \frac{\cancel{3}y^2}{(y+2)(y-2)}$$

$$= \frac{y^2}{2(y-2)}$$

14.

$$\frac{3y+15}{y} \div \frac{y+5}{y}$$

15.

$$\frac{y^2-36}{y^2-8y+16} \div \frac{3y-18}{y^2-y-12}$$

$$= \frac{(y+6)(y-6)}{(y-4)(y-4)} \cdot \frac{(y+3)(y-4)}{3(y-6)}$$

$$= \frac{(y+6)(y+3)}{3(y-4)}$$

16.

$$\frac{y^2+y-12}{y^3+9y^2+20y} \div \frac{y^2-9}{y^3+3y^2}$$

Answers: **11.** $12x^3y^2$; **13.** $\frac{y^2}{2(y-2)}$; **15.** $\frac{(y+6)(y+3)}{3(y-4)}$

Simplify completely.

17.

$$\frac{2x^2-3x-14}{2x^2-9x+7}\div\frac{6x^2+x-15}{3x^2+2x-5}\cdot\frac{6x^2-7x-3}{2x^2-x-3}$$

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

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

18.

$$\frac{10x^2-17x+3}{15x^2-8x+1}\div\frac{4x^2-12x+9}{3x^2+3xy-x-y}\cdot\frac{6x^2-11x+3}{2x^2-11x+12}$$

19.

$$\frac{x^3-27}{x^2-9}\cdot\frac{x^2-6x+9}{x^2+3x+9}$$

$$=\frac{(x-3)(x^2+3x+9)}{(x-3)(x+3)}\cdot\frac{(x-3)(x-3)}{x^2+3x+9}$$

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

20.

$$\frac{x^3-64}{x^3+64}\div\frac{x^2-16}{x^2-4x+16}$$

Answers: **17.** $\frac{(x+2)(3x+1)}{(2x-3)(x+1)}$; **19.** $\frac{(x-3)^2}{x+3}$