

$$1. \frac{3a-9b}{6a-18b} = \frac{3(\cancel{a-3b})}{6(\cancel{a-3b})} = \frac{3}{6} = \frac{1}{2}$$

$$2. \frac{8x-10}{16x^2-25} = \frac{2(\cancel{4x-5})}{(\cancel{4x-5})(4x+5)} = \frac{2}{(4x+5)}$$

3.

$$\begin{aligned} \frac{a^3-b^3}{6a-6b} &= \frac{(\cancel{a-b})(a^2+ab+b^2)}{6(\cancel{a-b})} \\ &= \frac{(a^2+ab+b^2)}{6} \end{aligned}$$

4.

$$\begin{aligned} \frac{by+b-y-1}{b^3-1} &= \frac{b(y+1)-1(y+1)}{(b-1)(b^2+b+1)} \\ &= \frac{(\cancel{b-1})(y+1)}{(\cancel{b-1})(b^2+b+1)} \\ &= \frac{y+1}{(b^2+b+1)} \end{aligned}$$

5.

$$\begin{aligned} \frac{x^2-x}{x^2-4x+3} &= \frac{x(x-1)}{x^2-1x-3x+3} \\ &= \frac{x(x-1)}{x(x-1)-3(x-1)} \\ &= \frac{x(\cancel{x-1})}{(\cancel{x-1})(x-3)} = \frac{x}{x-3} \end{aligned}$$

6.

$$\begin{aligned} \frac{2x^2+9x+4}{2x^2+11x+5} &= \frac{2x^2+8x+1x+4}{2x^2+10x+1x+5} \\ &= \frac{2x(x+4)+1(x+4)}{2x(x+5)+1(x+5)} \\ &= \frac{(\cancel{2x+1})(x+4)}{(\cancel{2x+1})(x+5)} \\ &= \frac{x+4}{x+5} \end{aligned}$$

7.

$$\begin{aligned}\frac{a^2 - b^2}{a^3 - b^3} &= \frac{\cancel{(a-b)}(a+b)}{\cancel{(a-b)}(a^2 + ab + b^2)} \\ &= \frac{a+b}{a^2 + ab + b^2}\end{aligned}$$

8.

$$\begin{aligned}\frac{a^2 - b^2}{a^4 - b^4} &= \frac{\cancel{(a-b)}(a+b)}{\cancel{(a^2 - b^2)}(a^2 + b^2)} \\ &= \frac{1}{a^2 + b^2}\end{aligned}$$

9.

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

10.
$$\frac{x-3}{9-x^2} = \frac{-1\cancel{(3-x)}}{\cancel{(3-x)}(3+x)} = -\frac{1}{3+x}$$

11.

$$\begin{aligned}\frac{ax + ay - cx - cy}{ax + ay + cx + cy} &= \frac{a(x+y) - c(x+y)}{a(x+y) + c(x+y)} \\ &= \frac{\cancel{(a-c)}\cancel{(x+y)}}{\cancel{(a+c)}\cancel{(x+y)}} \\ &= \frac{a-c}{a+c}\end{aligned}$$

12.

$$\begin{aligned}\frac{9y^3 - y}{3y^2 + 8y - 3} &= \frac{y(9y^2 - 1)}{3y^2 + 1y - 9y - 3} \\ &= \frac{y(3y-1)(3y+1)}{y(3y+1) - 3(3y+1)} \\ &= \frac{y(3y-1)\cancel{(3y+1)}}{(y-3)\cancel{(3y+1)}} \\ &= \frac{y(3y-1)}{y-3}\end{aligned}$$

13.

$$\begin{aligned}\frac{x^3 - 8}{x^2 + 2x + 4} &= \frac{x^3 - 2^3}{x^2 + 2x + 4} \\ &= \frac{\cancel{(x-2)}\cancel{(x^2 + 2x + 4)}}{\cancel{x^2 + 2x + 4}} \\ &= x - 2\end{aligned}$$

14.

$$\begin{aligned} \frac{(a+b)^2 - c^2}{a^2 - (b+c)^2} &= \frac{[(a+b) - c][(a+b) + c]}{[a - (b+c)][a + (b+c)]} \\ &= \frac{[a+b-c]\cancel{[a+b+c]}}{[a-b-c]\cancel{[a+b+c]}} \\ &= \frac{a+b-c}{a-b-c} \end{aligned}$$

15.

$$\begin{aligned} \frac{x^2 - 2xy + y^2 - z^2}{x^2 - y^2 - 2yz - z^2} &= \frac{(x-y)^2 - z^2}{x^2 - (y^2 + 2yz + z^2)} \\ &= \frac{(x-y)^2 - z^2}{x^2 - (y+z)^2} \\ &= \frac{[(x-y) - z][(x-y) + z]}{[x - (y+z)][x + (y+z)]} \\ &= \frac{\cancel{[x-y-z]}[x-y+z]}{\cancel{[x-y-z]}[x+y+z]} \\ &= \frac{x-y+z}{x+y+z} \end{aligned}$$

16.

$$\begin{aligned} \frac{x^2 - 25}{x^2 - 64} \times \frac{x^2 - 8x}{x-5} &= \frac{\cancel{(x-5)}(x+5)}{\cancel{(x-8)}(x+8)} \times \frac{x\cancel{(x-8)}}{\cancel{(x-5)}} \\ &= \frac{x(x+5)}{(x+8)} \end{aligned}$$

17.

$$\begin{aligned} \frac{9}{4x^2 - 16} \cdot \frac{2x-4}{27} &= \frac{1}{\cancel{(2x-4)}(2x+4)} \cdot \frac{\cancel{(2x-4)}}{3} \\ &= \frac{1}{3(2x+4)} \end{aligned}$$

18.

$$\begin{aligned} \frac{2x^2 - x - 1}{2x^2 + x - 11} \cdot \frac{4x^2 - 1}{x^2 - 1} &= \frac{(2x^2 - 2x + x - 1)}{(2x^2 + 2x - x - 1)} \cdot \frac{(2x-1)(2x+1)}{(x-1)(x+1)} \\ &= \frac{(2x(x-1) + 1(x-1))}{(2x(x+1) - 1(x+1))} \cdot \frac{(2x-1)(2x+1)}{(x-1)(x+1)} \\ &= \frac{(2x+1)\cancel{(x-1)}}{\cancel{(2x-1)}(x+1)} \cdot \frac{\cancel{(2x-1)}(2x+1)}{\cancel{(x-1)}(x+1)} \\ &= \frac{(2x+1)^2}{(x+1)^2} \end{aligned}$$

19.

$$\begin{aligned} \frac{15x^2}{8y^2} \div \frac{5x^3}{2} &= \frac{15x^2}{8y^2} \times \frac{2}{5x^3} \\ &= \frac{3}{4y^2} \times \frac{1}{x} = \frac{3}{4y^2x} \end{aligned}$$

20.

$$\begin{aligned} \frac{\frac{1}{9}(2x^2 - 50)}{\frac{1}{45}(4x^2 - 20x)} &= \frac{45 \times \frac{1}{9} \times 2(x^2 - 25)}{45 \times \frac{1}{45} \times 4x(x - 5)} \\ &= \frac{5 \times 2 \cancel{(x-5)}(x+5)}{4x \cancel{(x-5)}} = \frac{5(x+5)}{2x} \end{aligned}$$

21.

$$\begin{aligned} \frac{x}{y} &= \frac{a^3 - b^3}{a^3 + ab^2} \div \frac{a^3 - ab^2}{a^2b + b^3} \\ &= \frac{a^3 - b^3}{a^3 + ab^2} \cdot \frac{a^2b + b^3}{a^3 - ab^2} \\ &= \frac{(a-b)(a^2 + ab + b^2)}{a(a^2 + b^2)} \cdot \frac{b(a^2 + b^2)}{a(a^2 - b^2)} \\ &= \frac{\cancel{(a-b)}(a^2 + ab + b^2)}{a(a^2 + b^2)} \cdot \frac{b\cancel{(a^2 + b^2)}}{a\cancel{(a-b)}(a+b)} \\ &= \frac{b(a^2 + ab + b^2)}{a^2(a+b)} \end{aligned}$$

22.

$$\begin{aligned} \frac{x}{y} &= \frac{5b^2}{a^2 - ab} \div \frac{10ab}{b^2 - a^2} \\ &= \frac{5b^2}{a^2 - ab} \cdot \frac{b^2 - a^2}{10ab} \\ &= \frac{5b^2(b-a)(b+a)}{a(a-b)10ab} \\ &= \frac{-5b^2 \cancel{(a-b)}(b+a)}{a \cancel{(a-b)} 10ab} \\ &= \frac{-b(b+a)}{2a^2} \end{aligned}$$