

Simplify the rational expression, if possible.

<p>1. $\frac{4x^2}{40x^2 - 12x}$</p> <p>$4x^2$ $4x(10x-3)$ = $\frac{X}{10x-3}$</p>	<p>2. $\frac{x^2 + 2x - 24}{x^2 + 7x + 6}$</p> <p>$(x+6)(x-4)$ $(x+6)(x+1)$</p> <p>$\frac{X-4}{X+1}$</p>	<p>3. $\frac{x^2 + 4x + 4}{x^2 - 5x + 4}$</p> <p>$(x+2)(x+2)$ $(x-4)(x-1)$</p> <p>or $\frac{(x+2)^2}{(x-4)(x-1)}$</p> <p><i>* Nothing cancels... that's ok</i></p>
<p>4. $\frac{x-4}{x^3 - 64} \rightarrow$ SOAP</p> <p>$x-4$ $(x-4)(x^2+4x+16)$</p> <p>$\frac{1}{x^2+4x+16}$</p>	<p>5. $\frac{3x^3 + 6x^2 + 12x}{x^3 - 8} \rightarrow$ SOAP</p> <p>$3x(x^2+2x+4)$ $(x-2)(x^2+2x+4)$</p> <p>$\frac{3x}{x-2}$</p>	<p>6. $\frac{5x^2 + 18x - 8}{10x^2 - x - 2}$</p> <p>$(5x-2)(x+4)$ $(5x+2)(2x-1)$</p> <p>can't cancel... that's ok!</p>

Describe and correct the error in simplifying the rational expression.

7. ~~$\frac{x^2 + 16x - 80}{x^2 - 16} = \frac{16x - 80}{-16} = -x + 5$~~

8. ~~$\frac{x^2 + 16x + 48}{x^2 + 8x + 16} = \frac{x^2 + 2x + 3}{x^2 + x + 1}$~~

b/c no +/- signs

Multiply the expressions. Simplify the result.

<p>9. $\frac{5x^3y}{x^2y^2} \cdot \frac{y^3}{15x^2} \rightarrow$ mult. across</p> <p>$15x^3y^4$ $3 \cdot 15x^4y^2$</p> <p>$\frac{y^2x}{3x}$</p>	<p>10. $\frac{x(x-3)}{x-2} \cdot \frac{(x+3)(x-2)}{x}$</p> <p>already factored</p> <p>$= (x-3)(x+3)$</p>	<p>11. $\frac{3x-12}{x+5} \cdot \frac{x+6}{2x-8}$</p> <p>$3(x-4)$ $x+5$ \cdot $\frac{x+6}{2(x-4)}$</p> <p>$\frac{3(x+6)}{2(x+5)}$</p>
---	---	---

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

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

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

$$13. \frac{x^2 + 5x - 36}{x^2 - 49} \cdot (x^2 - 11x + 28)$$

$$\frac{(x+9)(x-4)}{\cancel{(x-7)}(x+7)} \cdot \frac{\cancel{(x-7)}(x-4)}{1}$$

$$\frac{(x+9)(x-4)(x-4)}{(x+7)}$$

or $\frac{(x+9)(x-4)^2}{x+7}$

Divide the expressions. Simplify the result.

$$14. \frac{5x^2y^3}{x^7} \div \frac{30xy^4}{y^3} \rightarrow \frac{5x^2y^3}{x^7} \cdot \frac{y^3}{30xy^4}$$

K C F

$$\frac{5x^2y^3}{30x^6y^4}$$

$$\frac{y^2}{6x^6}$$

mult. across
→ b/c no +/- signs

$$15. \frac{(x+3)(x-2)}{x(x+1)} \div \frac{x+3}{x} \rightarrow \frac{\cancel{(x+3)}(x-2)}{x(x+1)} \cdot \frac{x}{\cancel{x+3}}$$

K C F

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

$$16. \frac{x^2 - 6x - 27}{2x^2 + 2x} \div \frac{x^2 - 14x + 45}{x^2}$$

K C F

$$\frac{\cancel{(x-9)}(x+3)}{2x(x+1)} \cdot \frac{x^2}{\cancel{(x-9)}(x-5)}$$

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

$$17. \frac{3x^2 + 13x + 4}{x^2 - 4} \div \frac{4x + 16}{x + 2}$$

K C F

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

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

$$18. \frac{x^2 - 8x + 15}{x^2 + 4x} \div (x^2 - x - 20)$$

K C F

$$\frac{\cancel{(x-5)}(x-3)}{x(x+4)} \cdot \frac{1}{\cancel{(x-5)}(x+4)}$$

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

or $\frac{x-3}{x(x+4)^2}$

A fraction that contains a fraction in its numerator or denominator is called a(n) Complex fraction

Perform the indicated operation and simplify.

1. $\frac{3x^2}{x-8} + \frac{6x}{x-8}$

Same denominator

$$\frac{3x^2 + 6x}{x-8} \rightarrow \text{Factor just in case anything}$$

$$\frac{3x(x+2)}{x-8} \text{ cancels}$$

2. $\frac{5x}{x+3} + \frac{15}{x+3}$

Same denominator

$$\frac{5x + 15}{x+3} = \frac{5(x+3)}{x+3}$$

$$= 5$$

3. $\frac{12}{5x} + \frac{7}{6x}$ * 30 is smallest # that 5 & 6 go into.

both sides have an x

$$\frac{72 + 35}{30x}$$

$$= \frac{107}{30x}$$

4. $\frac{8}{3x^2} - \frac{5}{4x}$ CD $12x^2$

$$\frac{32 - 15x}{12x^2} = \frac{-15x + 32}{12x^2}$$

Standard form just in case you can factor

$$\frac{-(15x - 32)}{12x^2}$$

5. $\frac{(x-4)(x-4)}{5x} - \frac{12}{5(x-4)} \cdot \frac{x}{x}$

$$\frac{(x-4)(x-4) - 12 \cdot x}{5x(x-4)}$$

$$\frac{x^2 - 8x + 16 - 12x}{5x(x-4)}$$

$$\frac{x^2 - 20x + 16}{5x(x-4)} \rightarrow \text{can't factor ... it's ok}$$

6. $\frac{12}{x^2 + 5x - 24} + \frac{3}{x-3} \cdot \frac{(x+8)}{(x+8)}$

Fact. $(x+8)(x-3)$

Both sides have $x-3$ * right side is missing $x+8$

$$\frac{12 + 3(x+8)}{(x+8)(x-3)}$$

$$= \frac{3x + 36}{(x+8)(x-3)} \rightarrow \frac{3(x+12)}{(x+8)(x-3)}$$

7. $\frac{3}{(x+6)x+4} - \frac{1}{x+6} \cdot \frac{(x+4)}{(x+4)}$

$$\frac{3(x+6) - 1(x+4)}{(x+6)(x+4)}$$

* Can't cancel anything yet... b/c we aren't multiplying * can't cancel yet.

$$\frac{3x + 18 - x - 4}{(x+6)(x+4)}$$

$$\frac{2x + 14}{(x+6)(x+4)} \Rightarrow \frac{2(x+7)}{(x+6)(x+4)}$$

8. $\frac{9}{(x+1)x-3} + \frac{2x}{x+1} \cdot \frac{(x-3)}{(x-3)}$

$$\frac{9(x+1) + 2x(x-3)}{(x+1)(x-3)}$$

$$\frac{9x + 9 + 2x^2 - 6x}{(x+1)(x-3)} \rightarrow \text{Not factorable}$$

9. $\frac{x+4}{x^2-4} - \frac{15}{x-2} \cdot \frac{(x+2)}{(x+2)}$

* Both sides have an $(x-2)$

$$\frac{x+4 - 15(x+2)}{(x-2)(x+2)}$$

$$\frac{x+4 - 15x - 30}{(x-2)(x+2)}$$

$$\frac{-14x - 26}{(x+2)(x-2)} = \frac{-2(7x+13)}{(x+2)(x-2)}$$

$$10. \frac{-15x}{x^2 - 8x + 16} + \frac{12}{x-4} \frac{(x-4)}{(x-4)}$$

* Left side has 2 (x-4) *

$$-15x + 12(x-4) = -15x + 12x - 48$$

$$-3x - 48$$

$$\frac{-3(x+16)}{(x-4)^2}$$

$$11. \frac{x^2 - 5}{x^2 + 5x - 14} \frac{x+3}{x+7} \frac{(x-2)}{(x-2)}$$

* Both sides have an (x+7)

$$x^2 - 5 - (x+3)(x-2)$$

$$x^2 - 5 - (x^2 + x - 6)$$

$$x^2 - 5 - x^2 - x + 6$$

$$\frac{-x+1}{(x+7)(x-2)} \rightarrow \frac{-(x-1)}{(x+7)(x-2)}$$

Simplify the complex fraction.

$$12. \frac{\frac{x}{3} - 6}{10 + \frac{4}{x}} \frac{x-6}{3} \cdot \frac{3}{3}$$

$$\frac{x-18}{3} \cdot \frac{x}{x} \frac{10 + \frac{4}{x}}{x} \frac{3}{3}$$

$$\frac{10x+4}{x}$$

$$\frac{x-18}{3} \cdot \frac{x}{10x+4} \Rightarrow \frac{x(x-18)}{6(5x+2)}$$

$$13. \frac{15 - \frac{2}{x}}{\frac{x}{5} + 4} \rightarrow \frac{x \cdot 15 - \frac{2}{x}}{x \cdot \frac{x}{5} + 4x}$$

$$\frac{15x-2}{x} \div \frac{x+20}{5}$$

$$\frac{15x-2}{x} \cdot \frac{5}{x+20} \Rightarrow \frac{5(15x-2)}{x(x+20)}$$

$$14. \frac{\frac{16}{x-2}}{\frac{4}{x+1} + \frac{6(x+1)}{x}} \rightarrow \text{top is one fraction}$$

$$\frac{16}{x-2} \div \frac{4x+6(x+1)}{x(x+1)} = \frac{16}{x-2} \cdot \frac{x(x+1)}{4x+6x+6} = \frac{16}{x-2} \cdot \frac{x(x+1)}{10x+6}$$

$$\frac{8x(x+1)}{(x-2)(5x+3)}$$

$$15. \frac{\frac{1}{2x-5} - \frac{7}{8x-20}}{\frac{x}{2x-5}}$$

$$\frac{4}{4} \frac{1}{2x-5} - \frac{7}{4(2x-5)} \div \frac{x}{2x-5}$$

$$\frac{4-7}{4(2x-5)} = \frac{-3}{4(2x-5)}$$

$$\frac{-3}{4(2x-5)} \div \frac{x}{2x-5}$$

$$\frac{-3}{4(2x-5)} \cdot \frac{2x-5}{x} = \frac{-3}{4x} = \frac{3x}{4(x-1)}$$

$$16. \frac{\frac{(x+2)^3}{(x-2)^3} - \frac{6}{x^2-4}}{\frac{3}{(x-2)^2} + \frac{1}{x-2}} \frac{3(x+2)-6}{(x-2)(x+2)}$$

$$\frac{3x-6+x+2}{(x+2)(x-2)} = \frac{4x-4}{(x+2)(x-2)}$$

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

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

$$17. \frac{\frac{1}{3x^2-3}}{\frac{(x-4)^5}{(x-4)^4} - \frac{5}{x+4}} \rightarrow \frac{1}{3(x-1)(x+1)}$$

$$\frac{1}{3(x-1)(x+1)} \div \frac{5(x-4) - (x+4)}{(x-4)(x+1)}$$

$$\frac{1}{3(x-1)(x+1)} \cdot \frac{(x-4)(x+1)}{5x-20-x-4} = \frac{1}{3(x-1)(x+1)} \cdot \frac{(x-4)(x+1)}{4x-24}$$

$$\frac{1}{3(x-1)(x+1)} \div \frac{4(x-6)}{(x-4)(x+1)}$$

$$\frac{1}{3(x-1)(x+1)} \cdot \frac{(x-4)(x+1)}{4(x-6)} = \frac{x-4}{12(x-1)(x-6)}$$