10.3 Add and Subtract Rational Expressions

PRACTICE

Perform the indicated operation.

1. $\frac{a+5}{10a} - \frac{2a}{10a} = \frac{a+5-2a}{10a} = \frac{-a+5}{10a}$

2. $\frac{2p}{6p+6} + \frac{2}{p-2}$ (p-2) (p-2) 6(p+1) 6(p+1) 6(p+1) $= \frac{2p^2-4p+12p+12}{6(p+1)(p-2)} = \frac{2p^2+8p+12}{6(p+1)(p-2)}$

3. $\frac{5u}{u^3} + \frac{4}{3u}$ 3 3 u^2 u^2 $= \frac{15u+4u^2}{3u^3}$

4. $\frac{8}{(m+3)(m-1)} - \frac{4m+1}{(m+3)(m-1)} = \frac{8-(4m+1)}{(m+3)(m-1)} = \frac{-4m+7}{(m+3)(m-1)}$

5. $\frac{3}{x+4}$ (x+6) (x+6) $-\frac{1}{x+6}$ (x+4) (x+4) $\frac{3x+18-(x+4)}{(x+4)(x+6)} = \frac{2x+14}{(x+4)(x+6)}$

6. $\frac{3n}{n-2} + 4$ (n-2) 1(n-2) $\frac{3n+4n-8}{n-2} = \frac{7n-8}{n-2}$

7. $\frac{y+1}{4y^2-9} - \frac{4}{2y-3}$ $(2y+3)(2y-3)$ $\frac{(2y+3)}{(2y+3)} = \frac{y+1-(8y+12)}{(2y+3)(2y-3)} = \frac{y+1-8y-12}{(2y+3)(2y-3)} = \frac{-7y-11}{(2y+3)(2y-3)}$

8. $\frac{p+5}{p^2+5p-14} + \frac{2}{p+7}$ $(p+7)(p-2)$ $\frac{(p-2)}{(p-2)} = \frac{p+5+2p-4}{(p+7)(p-2)} = \frac{3p+1}{(p+7)(p-2)}$

9. $\frac{m}{3m^2-12} - \frac{3m+1}{m-2}$ $3(m^2-4)$ $3(m-2)(m+2)$ $\frac{3(m+2)}{3(m+2)} \quad \frac{m-[(3m+1)(3m+6)]}{3(m-2)(m+2)} = \frac{m-[9m^2+18m+3m+6]}{3(m-2)(m+2)}$

$= \frac{m-9m^2-21m-6}{3(m-2)(m+2)}$

$= \frac{-9m^2-20m-6}{3(m-2)(m+2)}$

10. $\frac{5t}{5t}\frac{1-t}{(t-2)^2} + \frac{4}{5t}$ $(t-2)(t-2)$ $\frac{(t-2)(t-2)}{(t-2)(t-2)} \quad \frac{5t-5t^2+(4t-8)(t-2)}{5t(t-2)(t-2)}$

$= \frac{5t-5t^2+4t^2-8t-8t+16}{5t(t-2)(t-2)}$

$= \frac{-t^2-11t+16}{5t(t-2)(t-2)}$

11. $\frac{(x+5)}{(x+5)}\frac{2}{2x^3-12x^2-80x} - \frac{5x}{x^2-5x-50}$ $2x(x^2-6x-40)$ $2x(x-10)(x+4)$ $2x(x-10)(x+4)$ $\frac{2x(x+4)}{2x(x+4)} \quad (x-10)(x+5)$

$= \frac{2x+10-[10x^2(x+4)]}{2x(x-10)(x+4)(x+5)} = \frac{2x+10-(10x^3+40x^2)}{2x(x-10)(x+4)(x+5)}$

$= \frac{2x+10-10x^3-40x^2}{2x(x-10)(x+4)(x+5)}$

$= \frac{-10x^3-40x^2+2x+10}{2x(x-10)(x+4)(x+5)}$

12. $\frac{5}{5}\frac{1}{w} + \frac{w-1}{5}\frac{w}{w}$ $\frac{5+w^2-w}{5w} = \frac{w^2-w+5}{5w}$

ERROR ANALYSIS Describe and correct the error.

13. $\frac{x}{x+2}+\frac{4}{x-5}=\frac{x+4}{(x+2)(x-5)}$

$\frac{(x-5)}{(x-5)}\frac{x}{x+2}+\frac{4(x+2)}{(x+2)(x-5)}=\frac{x+4}{(x+2)(x-5)}$ ✗

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

Just added the numerator and denominator. Need common denominator!

Perform the indicated operations.

14. $\frac{3}{r+2}+\frac{2r}{r+2}-\frac{7}{r+2}$

$=\frac{2r-4}{r+2}$

15. $\frac{5d}{3(d+2)}+\frac{2}{3}+\frac{4d}{d^2-4}$

$\frac{(d-2)}{(d-2)}\frac{5d}{3(d+2)}+\frac{2}{3}\frac{(d+2)(d-2)}{(d+2)(d-2)}+\frac{4d}{(d+2)(d-2)}\frac{3}{3}$

$\frac{5d^2-10d+(2d+4)(d-2)+12d}{3(d+2)(d-2)}$

$=\frac{5d^2-10d+2d^2-4d+4d-8+12d}{3(d+2)(d-2)}$

$=\frac{7d^2+2d-8}{3(d+2)(d-2)}$

Simplify.

16. $\frac{\frac{2}{3}-\frac{x}{9}}{\frac{4}{9}-\frac{x-3}{4}}$

$\frac{36}{36}\frac{24-4x}{16-(9x-27)}$

$=\frac{-4x+24}{-9x+43}$

17. $\frac{\frac{5}{x}+\frac{5}{x^2}}{\frac{16}{25}-\frac{3}{x^2}}$

$\frac{25x^2}{25x^2}\frac{125x+125}{16x^2-75}$

18. $\frac{\frac{9}{x-3}}{\frac{x}{12}-\frac{4}{x-3}}$

$\frac{12(x-3)}{12(x-3)}\frac{108}{x(x-3)-48}$

$=\frac{108}{x^2-3x-48}$

19. $\frac{\frac{2}{3}+\frac{7}{x-4}}{\frac{4}{x^2-16}+5}$

$\frac{3(x+4)(x-4)}{3(x+4)(x-4)}\frac{2(x+4)(x-4)+21(x+4)}{12+15(x+4)(x-4)}$

$=\frac{(2x+8)(x-4)+21x+84}{12+(15x+60)(x-4)}$

$=\frac{2x^2-8x+8x-32+21x+84}{12+15x^2-60x+60x-240}$

$=\frac{2x^2+21x+52}{15x^2-228}$