

Section 2: Rational expressions**Section test**

1. The simplest form of the fraction $\frac{2x^2y}{6x(y+1)}$ is

(a) $\frac{xy}{4(y+1)}$

(b) $\frac{x}{3}$

(c) $\frac{xy}{3(y+1)}$

(d) $\frac{x}{4}$

2. $\frac{2x}{3y^3} \times \frac{6y}{x^2+2x}$, expressed in its simplest form, is

(a) $\frac{2}{x^2y^2}$

(b) $\frac{4}{y^2(x+2)}$

(c) $\frac{4}{x^2}$

(d) $\frac{4}{x^2y^2+2}$

3. $\frac{x^2-6x}{4x+4} \times \frac{x^2+5x-6}{x^2-36}$, expressed in its simplest form, is

(a) $\frac{x}{4}$

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

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

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

4. $\frac{3}{x-2} \div \frac{x^2-3x-18}{x^2-5x+6}$, expressed in its simplest form, is

(a) $\frac{3}{x-6}$

(b) $\frac{3}{x+6}$

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

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

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5. $\frac{2a}{b} + \frac{b}{3a} =$

(a) $\frac{6a^2 + b^2}{3ab}$

(c) $\frac{2a+b}{3ab}$

(b) $\frac{2a+b}{3a+b}$

(d) $\frac{6a^2 + b^2}{3a+b}$

6. $\frac{5}{x+2} - \frac{3}{2x-1} =$

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

(c) $\frac{7x-11}{(x+2)(2x-1)}$

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

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

7. $\frac{a^2 + 5a}{a^2 + a - 20} + \frac{a^2 - 3a - 10}{a^2 + 2a - 35}$

(a) $\frac{2a^2 - 2a - 15}{(a-4)(a+7)}$

(c) $\frac{2a^2 + 2a - 10}{2a^2 + 3a - 55}$

(b) $\frac{2a^2 + 5a - 8}{(a-4)(a+7)}$

(d) $\frac{2a^2 + 7a - 8}{(a-4)(a-7)}$

8. Simplify the equation $\frac{x-1}{x+2} + \frac{2x-1}{x} = 2$ to the form $ax^2 + bx + c = 0$, where a is positive and a , b and c are all integers with no common factor.

9. When $3x^3 - x - 2$ is divided by $x + 1$, find the quotient and the remainder.

10. When $8x - 3$ is divided by $4x + 1$, find the quotient and the remainder.

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Section test solutions

$$\begin{aligned} 1. \quad \frac{2x^2y}{6x(y+1)} &= \frac{\cancel{2x}(xy)}{\cancel{2x}[3(y+1)]} \\ &= \frac{xy}{3(y+1)} \end{aligned}$$

$$\begin{aligned} 2. \quad \frac{2x}{3y^3} \times \frac{6y}{x^2+2x} &= \frac{2x}{3y^3} \times \frac{6y}{x(x+2)} \\ &= \frac{\cancel{2x}}{\cancel{3}y^{\cancel{3}2}} \times \frac{\cancel{2}^2\cancel{6}y}{x(x+2)} \\ &= \frac{4}{y^2(x+2)} \end{aligned}$$

$$\begin{aligned} 3. \quad \frac{x^2-6x}{4x+4} \times \frac{x^2+5x-6}{x^2-36} &= \frac{x(\cancel{x-6})}{4(x+1)} \times \frac{(\cancel{x+6})(x-1)}{(\cancel{x+6})(\cancel{x-6})} \\ &= \frac{x(x-1)}{4(x+1)} \end{aligned}$$

$$\begin{aligned} 4. \quad \frac{3}{x-2} \div \frac{x^2-3x-18}{x^2-5x+6} &= \frac{3}{x-2} \times \frac{x^2-5x+6}{x^2-3x-18} \\ &= \frac{3}{\cancel{x-2}} \times \frac{(x-3)\cancel{(x-2)}}{(x-6)(x+3)} \\ &= \frac{3(x-3)}{(x-6)(x+3)} \end{aligned}$$

5. The common denominator is $3ab$

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

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6. The common denominator is $(x+2)(2x-1)$

$$\begin{aligned}\frac{5}{x+2} - \frac{3}{2x-1} &= \frac{5(2x-1) - 3(x+2)}{(x+2)(2x-1)} \\ &= \frac{10x - 5 - 3x - 6}{(x+2)(2x-1)} \\ &= \frac{7x - 11}{(x+2)(2x-1)}\end{aligned}$$

$$\begin{aligned}7. \frac{a^2 + 5a}{a^2 + a - 20} + \frac{a^2 - 3a - 10}{a^2 + 2a - 35} &= \frac{a\cancel{(a+5)}}{\cancel{(a+5)}(a-4)} + \frac{\cancel{(a-5)}(a+2)}{(a+7)\cancel{(a-5)}} \\ &= \frac{a}{a-4} + \frac{a+2}{a+7}\end{aligned}$$

The common denominator is $(a-4)(a+7)$

$$\begin{aligned}\frac{a}{a-4} + \frac{a+2}{a+7} &= \frac{a(a+7)}{(a-4)(a+7)} + \frac{(a-4)(a+2)}{(a-4)(a+7)} \\ &= \frac{a^2 + 7a + a^2 - 2a - 8}{(a-4)(a+7)} \\ &= \frac{2a^2 + 5a - 8}{(a-4)(a+7)}\end{aligned}$$

8. The common denominator is $x(x+2)$. Multiply through by this expression.

$$\begin{aligned}\frac{x-1}{x+2} + \frac{2x-1}{x} &= 2 \\ \frac{x-1 \times x(x+2)}{x+2} + \frac{2x-1 \times x(x+2)}{x} &= 2x(x+2) \\ x(x-1) + (2x-1)(x+2) &= 2x(x+2) \\ x^2 - x + 2x^2 - 2 + 3x &= 2x^2 + 4x \\ x^2 - 2x - 2 &= 0\end{aligned}$$

9. Let the quotient be $ax^2 + bx + c$ and the remainder be d .

$$\begin{aligned}3x^3 - x - 2 &= (ax^2 + bx + c)(x+1) + d \\ &= ax^3 + (a+b)x^2 + (b+c)x + c + d\end{aligned}$$

Comparing coefficients of x^3 : $a = 3$

Comparing coefficients of x^2 : $a + b = 0 \Rightarrow b = -3$

Comparing coefficients of x : $b + c = -1 \Rightarrow c = 2$

Comparing constant terms: $c + d = -2 \Rightarrow d = -4$

$$3x^3 - x - 2 \div x + 1 = 3x^2 - 3x + 2 \text{ remainder } -4$$

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10. Let the quotient be a and the remainder be b .

$$8x - 3 = a(4x + 1) + b$$

$$= 4ax + a + b$$

Comparing coefficients of x : $8 = 4a \Rightarrow a = 2$

Comparing constant terms: $-3 = a + b \Rightarrow b = -5$

$$8x - 3 \div 4x + 1 = 2 \text{ remainder } -5$$