INTALG: Polynomials and Rational Expressions

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Learning Objectives

- Multiply polynomials using FOIL and special products
- Factor polynomials completely (GCF, trinomial, difference of squares)
- Simplify, multiply, and divide rational expressions
- Find the domain of a rational expression

Simplify each expression completely. Show all steps and circle your final answer.

Multiplying polynomials

1. Expand using FOIL: (1x + 1)(3x + 2).

$$(1x + 1)(3x + 2)$$

Answer: _____

2. Expand using FOIL: (3x + 4)(4x + 3).

$$(3x + 4)(4x + 3)$$

Answer: _____

3. Expand using FOIL: (3x + 2)(3x + 7).

$$(3x + 2)(3x + 7)$$

Answer: _____

4. Expand using FOIL: (2x + 7)(2x + 2).

$$(2x + 7)(2x + 2)$$

Answer: _____

5. Expand using FOIL: (2x + 4)(3x + 4).

$$(2x + 4)(3x + 4)$$

Answer: _____

6. Expand using FOIL: (1x + 3)(1x + 2).

$$(1x + 3)(1x + 2)$$

Answer: _____

7. Expand using FOIL: (3x + 3)(2x + 3).

$$(3x + 3)(2x + 3)$$

Answer: _____

8. Expand using FOIL: (4x + 4)(3x + 3).

$$(4x + 4)(3x + 3)$$

Answer: _____

9. Expand using FOIL: (1x + 3)(4x + 2).

$$(1x + 3)(4x + 2)$$

Answer: _____

10. Expand using FOIL: (1x + 1)(2x + 1).

$$(1x + 1)(2x + 1)$$

Answer: _____

Rational expressions — domain

11. Find the excluded value(s) for f(x) = (1x + -2) / (2x + 4).

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

Answer: _____

12. Find the excluded value(s) for f(x) = (1x + 0) / (1x + 8).

$$f(x) = \frac{1x + 0}{1x + 8}$$

Answer: _____

13. Find the excluded value(s) for f(x) = (1x + -1) / (4x + -7).

$$f(x) = \frac{1x + -1}{4x + -7}$$

Answer: _____

14. Find the excluded value(s) for f(x) = (3x + -6) / (5x + 5).

$$f(x) = \frac{3x + -6}{5x + 5}$$

Answer: _____

15. Find the excluded value(s) for f(x) = (1x + -3) / (2x + -1).

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

Answer: _____

16. Find the excluded value(s) for f(x) = (5x + -3) / (2x + 10).

$$f(x) = \frac{5x + -3}{2x + 10}$$

Answer: _____

17. Find the excluded value(s) for f(x) = (4x + -4) / (5x + -4).

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

Answer: _____

18. Find the excluded value(s) for f(x) = (4x + -5) / (5x + 2).

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

Answer: _____

19. Find the excluded value(s) for f(x) = (1x + -5) / (4x + 4).

$$f(x) = \frac{1x + -5}{4x + 4}$$

Answer: _____

20. Find the excluded value(s) for f(x) = (1x + -2) / (4x + 4).

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

Answer: _____

Simplifying rational expressions

21. Simplify: (5x + 25) / (5x + 25). State any excluded values.

$$\frac{5x + 25}{5x + 25}$$

Answer: _____

22. Simplify: (4x + 4) / (4x + 16). State any excluded values.

$$\frac{4x+4}{4x+16}$$

Answer: _____

23. Simplify: (5x + 15) / (5x + 15). State any excluded values.

$$\frac{5x+15}{5x+15}$$

Answer: _____

24. Simplify: (3x + 12) / (3x + 15). State any excluded values.

$$\frac{3x+12}{3x+15}$$

Answer: _____

25. Simplify: (2x + 8) / (2x + 12). State any excluded values.

$$\frac{2x+8}{2x+12}$$

Answer: _____

26. Simplify: (3x + 3) / (3x + 18). State any excluded values.

$$\frac{3x+3}{3x+18}$$

Answer: _____

27. Simplify: (3x + 3) / (3x + 6). State any excluded values.

$$\frac{3x+3}{3x+6}$$

Answer: _____

28. Simplify: (5x + 15) / (5x + 15). State any excluded values.

$$\frac{5x+15}{5x+15}$$

Answer: _____

29. Simplify: (5x + 30) / (5x + 30). State any excluded values.

$$\frac{5x+30}{5x+30}$$

Answer: _____

30. Simplify: (4x + 20) / (4x + 20). State any excluded values.

$$\frac{4x+20}{4x+20}$$

Answer: _____

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ANSWER KEY & SOLUTIONS

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Topics: Simplifying rational expressions, Rational expressions — domain, Multiplying polynomials. All answers verified by independent computation.

Solutions

Multiplying polynomials

1. Expand using FOIL: (1x + 1)(3x + 2).

$$(1x+1)(3x+2)$$

→ *F: 3x^2. O: 2x. I: 3x. L: 2.*
→ *= 3x^2 + 5x + 2.*

Answer: $3x^2+5x+2$

2. Expand using FOIL: (3x + 4)(4x + 3).

$$(3x+4)(4x+3)$$

→ *F: 12x^2. O: 9x. I: 16x. L: 12.*
→ *= 12x^2 + 25x + 12.*

Answer: $12x^2+25x+12$

3. Expand using FOIL: (3x + 2)(3x + 7).

$$(3x+2)(3x+7)$$

→ *F: 9x^2. O: 21x. I: 6x. L: 14.*
→ *= 9x^2 + 27x + 14.*

Answer: $9x^2+27x+14$

4. Expand using FOIL: (2x + 7)(2x + 2).

$$(2x+7)(2x+2)$$

→ *F: 4x^2. O: 4x. I: 14x. L: 14.*
→ *= 4x^2 + 18x + 14.*

Answer: $4x^2+18x+14$

5. Expand using FOIL: (2x + 4)(3x + 4).

$$(2x+4)(3x+4)$$

→ *F: 6x^2. O: 8x. I: 12x. L: 16.*
→ *= 6x^2 + 20x + 16.*

Answer: $6x^2+20x+16$

6. Expand using FOIL: (1x + 3)(1x + 2).

$$(1x+3)(1x+2)$$

→ *F: 1x^2. O: 2x. I: 3x. L: 6.*
→ *= 1x^2 + 5x + 6.*

Answer: $1x^2+5x+6$

7. Expand using FOIL: (3x + 3)(2x + 3).

$$(3x + 3)(2x + 3)$$

→ *F: 6x^2. O: 9x. I: 6x. L: 9.*
→ *= 6x^2 + 15x + 9.*

Answer: $6x^2 + 15x + 9$

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8. Expand using FOIL: (4x + 4)(3x + 3).

$$(4x + 4)(3x + 3)$$

→ *F: 12x^2. O: 12x. I: 12x. L: 12.*
→ *= 12x^2 + 24x + 12.*

Answer: $12x^2 + 24x + 12$

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9. Expand using FOIL: (1x + 3)(4x + 2).

$$(1x + 3)(4x + 2)$$

→ *F: 4x^2. O: 2x. I: 12x. L: 6.*
→ *= 4x^2 + 14x + 6.*

Answer: $4x^2 + 14x + 6$

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10. Expand using FOIL: (1x + 1)(2x + 1).

$$(1x + 1)(2x + 1)$$

→ *F: 2x^2. O: 1x. I: 2x. L: 1.*
→ *= 2x^2 + 3x + 1.*

Answer: $2x^2 + 3x + 1$

Rational expressions — domain

11. Find the excluded value(s) for f(x) = (1x + -2) / (2x + 4).

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

→ *Set 2x + 4 = 0. Solve: x = -2.*

Answer: $x \neq -2$

12. Find the excluded value(s) for f(x) = (1x + 0) / (1x + 8).

$$f(x) = \frac{1x + 0}{1x + 8}$$

→ *Set 1x + 8 = 0. Solve: x = -8.*

Answer: $x \neq -8$

13. Find the excluded value(s) for f(x) = (1x + -1) / (4x + -7).

$$f(x) = \frac{1x + -1}{4x + -7}$$

→ *Set 4x + -7 = 0. Solve: x = 7/4.*

Answer: $x \neq 7/4$

14. Find the excluded value(s) for f(x) = (3x + -6) / (5x + 5).

$$f(x) = \frac{3x + -6}{5x + 5}$$

→ *Set 5x + 5 = 0. Solve: x = -1.*

Answer: $x \neq -1$

15. Find the excluded value(s) for f(x) = (1x + -3) / (2x + -1).

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

→ *Set 2x + -1 = 0. Solve: x = 1/2.*

Answer: $x \neq 1/2$

16. Find the excluded value(s) for f(x) = (5x + -3) / (2x + 10).

$$f(x) = \frac{5x + -3}{2x + 10}$$

→ *Set 2x + 10 = 0. Solve: x = -5.*

Answer: $x \neq -5$

17. Find the excluded value(s) for f(x) = (4x + -4) / (5x + -4).

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

→ *Set 5x + -4 = 0. Solve: x = 4/5.*

Answer: $x \neq 4/5$

18. Find the excluded value(s) for f(x) = (4x + -5) / (5x + 2).

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

→ *Set 5x + 2 = 0. Solve: x = -2/5.*

Answer: $x \neq -2/5$

19. Find the excluded value(s) for f(x) = (1x + -5) / (4x + 4).

$$f(x) = \frac{1x + -5}{4x + 4}$$

→ *Set 4x + 4 = 0. Solve: x = -1.*

Answer: $x \neq -1$

20. Find the excluded value(s) for f(x) = (1x + -2) / (4x + 4).

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

→ *Set 4x + 4 = 0. Solve: x = -1.*

Answer: $x \neq -1$

Simplifying rational expressions

21. Simplify: (5x + 25) / (5x + 25). State any excluded values.

$$\frac{5x+25}{5x+25}$$

→ *Factor: 5(x + 5) / 5(x + 5).*
→ *Cancel 5: (x + 5)/(x + 5), x != -5.*

Answer: $\frac{x+5}{x+5},\ x \neq -5$

22. Simplify: (4x + 4) / (4x + 16). State any excluded values.

$$\frac{4x+4}{4x+16}$$

→ *Factor: 4(x + 1) / 4(x + 4).*
→ *Cancel 4: (x + 1)/(x + 4), x != -4.*

Answer: $\frac{x+1}{x+4},\ x \neq -4$

23. Simplify: (5x + 15) / (5x + 15). State any excluded values.

$$\frac{5x+15}{5x+15}$$

→ *Factor: 5(x + 3) / 5(x + 3).*
→ *Cancel 5: (x + 3)/(x + 3), x != -3.*

Answer: $\frac{x+3}{x+3},\ x \neq -3$

24. Simplify: (3x + 12) / (3x + 15). State any excluded values.

$$\frac{3x+12}{3x+15}$$

→ *Factor: 3(x + 4) / 3(x + 5).*
→ *Cancel 3: (x + 4)/(x + 5), x != -5.*

Answer: $\frac{x+4}{x+5},\ x \neq -5$

25. Simplify: (2x + 8) / (2x + 12). State any excluded values.

$$\frac{2x+8}{2x+12}$$

→ *Factor: 2(x + 4) / 2(x + 6).*
→ *Cancel 2: (x + 4)/(x + 6), x != -6.*

Answer: $\frac{x+4}{x+6},\ x \neq -6$

26. Simplify: (3x + 3) / (3x + 18). State any excluded values.

$$\frac{3x+3}{3x+18}$$

→ *Factor: 3(x + 1) / 3(x + 6).*
→ *Cancel 3: (x + 1)/(x + 6), x != -6.*

Answer: $\frac{x+1}{x+6},\ x \neq -6$

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27. Simplify: (3x + 3) / (3x + 6). State any excluded values.

$$\frac{3x+3}{3x+6}$$

→ *Factor: 3(x + 1) / 3(x + 2).*
→ *Cancel 3: (x + 1)/(x + 2), x != -2.*

Answer: $\frac{x+1}{x+2},\ x \neq -2$

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28. Simplify: (5x + 15) / (5x + 15). State any excluded values.

$$\frac{5x+15}{5x+15}$$

→ *Factor: 5(x + 3) / 5(x + 3).*
→ *Cancel 5: (x + 3)/(x + 3), x != -3.*

Answer: $\frac{x+3}{x+3},\ x \neq -3$

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29. Simplify: (5x + 30) / (5x + 30). State any excluded values.

$$\frac{5x+30}{5x+30}$$

→ *Factor: 5(x + 6) / 5(x + 6).*
→ *Cancel 5: (x + 6)/(x + 6), x != -6.*

Answer: $\frac{x+6}{x+6},\ x \neq -6$

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30. Simplify: (4x + 20) / (4x + 20). State any excluded values.

$$\frac{4x+20}{4x+20}$$

→ *Factor: 4(x + 5) / 4(x + 5).*
→ *Cancel 4: (x + 5)/(x + 5), x != -5.*

Answer: $\frac{x+5}{x+5},\ x \neq -5$
