Exercises [A–1]

Perform the indicated operations in each of the following, and express the result in lowest terms:

1. $\frac{1}{x}-\frac{1}{x+1}$
2. $\frac{x}{2y}-\frac{5x}{6y}+\frac{x}{3y}$
3. $\frac{a+b}{a^2}-\frac{1}{a}$
4. $\frac{1}{p-1}-\frac{1}{p+1}$
5. $\frac{1}{p-1}+\frac{1}{1-p}$
6. $\frac{1}{p+1}+\frac{p}{1+p}$
7. $1-\frac{p}{1+p}$
8. $\frac{p+q}{p-q}-1$
9. $\frac{p}{p-q}-\frac{q}{q+p}$
10. $\frac{3}{x-3}+\frac{2}{3-x}$
11. $\frac{3n}{n-1}+\frac{3}{1-n}$
12. $\frac{4a}{3b-2a}+\frac{6b}{2a-3b}$
13. $\frac{n}{n-1}-\frac{2n}{n^2-1}$
14. $\frac{1}{4a-2b}-\frac{1}{4a+2b}-\frac{b}{4a^2-b^2}$
15. $\frac{x}{x^2-4}+\frac{2}{2-x}$
16. $\frac{1}{(a-b)(a-c)}+\frac{1}{(b-c)(b-a)}$
17. $\frac{1}{a+2}+\frac{2}{2a+a^2}$
18. $\frac{1}{m-n}-\frac{m}{(n-m)^2}$
19. $\frac{a+2}{a^2+3a}-\frac{a-2}{a^2-3a}$
20. $\frac{p}{p^2-5p+6}+\frac{2}{p-2}-\frac{3}{p-3}$
21. $\frac{b^2+1}{b^2-1}+\frac{1}{1+b}-\frac{1}{1-b}$
22. $\frac{2(3a+b)}{5a^2+6ab+b^2}-\frac{a-b}{5a^2-4ab-b^2}$
23. $\frac{a+b}{a^2-4b^2}+\frac{a-b}{(a+2b)^2}$
24. $\frac{1}{x-3}+\frac{1}{x+3}-\frac{2}{x}$
25. $\frac{1}{(a-b)(a-c)}+\frac{1}{(b-c)(b-a)}+\frac{1}{(c-a)(c-b)}$
26. $\frac{2}{a+3b}-\frac{1}{2a+b}-\frac{a+b}{a^2+4ab+3b^2}$
27. $\frac{2}{x^2+2x-3}-\frac{3}{2x^2+2x-4}$

Exercises [A–2]

Combine the following fractions, and express the result in lowest terms.

1. $\frac{3a}{a-2b}+\frac{6b}{2b-a}$

2. $\frac{b}{a+b}+\frac{a}{b-a}+1$

3. $\frac{2}{a-b}+\frac{a+3b}{b^2-a^2}$

4. $\frac{b}{a^2-ab}-\frac{a}{ab-b^2}$

5. $\frac{1}{4x-4}-\frac{1}{2x^2-2}$

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

7. $\frac{2}{x^2-2x}-\frac{3}{x^2-x-2}$

8. $\frac{t}{(1-t)^2}+\frac{1}{1-t^2}$

9. $\frac{x}{2x-1}+\frac{x-1}{2x+1}-\frac{2x}{4x^2-1}$

10. $\frac{a+2b}{a^2-ab}-\frac{2a+b}{a^2-3ab+2b^2}-\frac{a-3b}{a^2-2ab}$

11. $\frac{x+3}{5x-10}-\frac{x-2}{5x+15}+\frac{5}{x^2+x-6}$

12. $\frac{a+3b}{2b+2a}+\frac{a}{b-a}+\frac{a^2+b^2}{a^2-b^2}$

13. $\frac{x-3}{2x+6}-\frac{x+3}{3x-9}-\frac{5x^2+27}{6x^2-54}$

14. $\frac{y+1}{(y-1)^2}+\frac{2-2y}{(y-1)^3}+\frac{1}{y-1}$

15. $\frac{a+2}{a^2+5a+6}-\frac{2+a}{4-a^2}+\frac{2-a}{a^2+a-6}$

16. $\frac{a}{(a-b)(a-c)}+\frac{b}{(b-c)(b-a)}$

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1. $\frac{1}{x(x+1)}$
2. 0
3. $\frac{b}{a^2}$
4. $\frac{2}{(p+1)(p-1)}$
5. 0
6. 1
7. $\frac{1}{1+p}$
8. $\frac{2q}{p-q}$
9. $\frac{p^2+q^2}{(p+q)(p-q)}$
0. $\frac{1}{x-3}$
1. 3
2. -2
3. $\frac{n}{n+1}$
4. 0
15. $\frac{4+x}{(2+x)(2-x)}$, or $-\frac{x+4}{(x+2)(x-2)}$
16. $\frac{1}{(b-c)(c-a)}$
17. $\frac{1}{a}$
18. $\frac{-n}{(m-n)^2}$
19. $\frac{2}{(3+a)(3-a)}$, or $-\frac{2}{(a+3)(a-3)}$
20. 0
21. $\frac{b+1}{b-1}$
22. $\frac{1}{a+b}$
23. $\frac{2a^2+4b^2}{(a+2b)^2(a-2b)}$
24. $\frac{18}{x(x+3)(x-3)}$
25. 0
26. $\frac{a-2b}{(a+3b)(2a+b)}$
27. $\frac{1}{2(x+3)(x+2)}$

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1. 3
2. $\frac{-2b^2}{(a+b)(a-b)}$
3. $\frac{1}{a+b}$
4. $-\frac{a+b}{ab}$
5. $\frac{1}{4(x+1)}$
6. 0
7. $\frac{-1}{x(x+1)}$
8. $\frac{1+t^2}{(1-t)^2(1+t)}$
9. $\frac{2x-1}{2x+1}$
10. $\frac{-2a^2+3ab-7b^2}{a(a-b)(a-2b)}$
11. $\frac{2}{x-2}$
12. $\frac{1}{2}$
13. $-\frac{2x^2+15x+9}{3(x+3)(x-3)}$
14. $\frac{2}{y-1}$
15. $\frac{1}{a-2}$
16. $\frac{c}{(c-a)(b-c)}$, or $\frac{-c}{(a-c)(b-c)}$