



1. Resuelve la ecuación:

[Grado 3-A]

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|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. $6x^2-1 = x^2(x+3)+x^3$ | 2. $9x^2-4 = 2x^2(x+1)+4x$ | 3. $12x-4 = x^2(3x+2)-3x^2$ | 4. $x-2(3x^2-x) = 3x^3+2x^2$ |
| 5. $x(3x^2-3x)+8x^2+2x = 0$ | 6. $3x^3+11x^2-9x = 3x(x-2)$ | 7. $2(3x+3)-3x^3-7x^2-6 = 0$ | 8. $4x^3-x^2(x+3)+x^2 = 3x-2$ |
| 9. $5x^2-3x^2(x+1)+27x = 18$ | 10. $5x^3-8x^2-4x = 2x^2(x-2)$ | 11. $4x^3-6x^2-9x = x^2(2x-3)$ | 12. $5x^2-x^3 = x(2x^2-2x)-6x$ |
| 13. $2x^2(3x-2)-8x^3 = x^2+2x$ | 14. $3x(x+1)+2x^3-6x^2-5x = 0$ | 15. $2(x-3)+2x^3+9 = 10x-3x^2$ | 16. $4x^3+3x = 2x^2(3x+1)-3x^2$ |
| 17. $3x^2(3x+2)-4x^2+x = 12x^3$ | 18. $7x^3+27 = 3x^2(3x+1)+6x^2$ | 19. $2(x^3-3x^2)+17x+6 = -17x^2$ | 20. $6x^2-2x^2(2x-1)-3x = 2-x^3$ |
| 21. $3x(3x^2+x)-11x^3 = 2x-2x^2$ | 22. $2x^2(2x-2)-6x^3+11x^2-9 = 0$ | 23. $5x^3-3x^2(x+1)-12 = 4x-8x^2$ | 24. $3(x^2+2x)+2x^2-10x = 3-2x^3$ |

2. Resuelve la ecuación:

[Grado 3-B]

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|------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 1. $9x-9x^3-2(x+1) = 0$ | 2. $3x-6x^2 = 2x^2(2x-1)$ | 3. $2-4x^3 = 2(3x-2)-19x$ | 4. $-2(2x^2+x)-9x^3 = 5x^2$ |
| 5. $12x^2-2x = 3x(3x^2+x)$ | 6. $8x^3-x^2-2x = x^2(2x-2)$ | 7. $2(2x-3)-9x^3+x = 6x^2-8$ | 8. $3(x-2)-9x^3+6 = 5x-9x^2$ |
| 9. $x-8x^3 = 3x^2-x(2x^2+2x)$ | 10. $2x(x-2)+3x^2+10x = 6x^3$ | 11. $x(x+3)-12x^2+2 = 6x-6x^3$ | 12. $2(x+2)+9x^3+9x^2-18x = 0$ |
| 13. $2x^2(3x+1)+3x^3-5x^2 = 2x$ | 14. $x^2(x-1)-21x-9 = 3x^2-3x^3$ | 15. $3x(2x+3)-6x^3-x^2-10x = 0$ | 16. $8x^3-2x^2(2x-3)-10x^2 = 3x$ |
| 17. $12x^3-22x^2+4 = 3x^2(2x-3)$ | 18. $3x-5x^2+2 = 3x(x^2+2)-9x^3$ | 19. $9x^3-x^2(3x-1)-3x = 2-10x^2$ | 20. $15x^2-3(2x^2-3x) = 9x^3+11x$ |
| 21. $6x^3-2(2x-3)-13x^2 = 10x+9$ | 22. $x^2(x-2)-2x^2+6 = 11x-3x^3$ | 23. $12x^2-9x^3+11x = 4-3x(x-1)$ | |
| 24. $2-11x-x^2(2x+3) = 7x^3-21x^2$ | | | |

3. Resuelve la ecuación:

[Grado 3-C]

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|---------------------------------|--------------------------------|----------------------------------|---------------------------------|
| 1. $3x^2-x(x^2-2) = 39-3x$ | 2. $3x(x-1)-10x = x^3-3x^2$ | 3. $6x^2-31x = x(x^2-3x)-39$ | 4. $8x^3-3x^2(3x+1)-12x = 10$ |
| 5. $x^3-x^2-7x-5 = x(2x^2+2x)$ | 6. $5x^3-31x = 3x^2(2x-3)-39$ | 7. $3x(x^2+x)-4x^3-3x^2-x = 10$ | 8. $19x-2x(x-3)-5x^2 = 39-x^3$ |
| 9. $26-x^3-5x = 2(x^2-2x)+2x^2$ | 10. $30-4x-3x^2 = x^3-3(3x+3)$ | 11. $3x^2-3x^2(2x-1) = 13x-5x^3$ | 12. $x^3+8x^2+15x = x(3x-1)-30$ |

4. Resuelve la ecuación:

[Grado 4-A]

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|---|---|--|
| 1. $2x^3+9x = 3x^2(x^2+3x)-x^4$ | 2. $5x-6x^3-x^3(3x-1) = 2-5x^2$ | 3. $8x^2-2x^4-8 = 12x-x^2(3x+2)$ |
| 4. $x^2(x+2)-8x^3+5x^2 = 3x^4-3x$ | 5. $x^3(3x+1)-32x-12 = 21x^2-x^3$ | 6. $x^3-x^4+3x^2+x-1 = x^2(x^2+2x)$ |
| 7. $9-2x^4-5x^3 = x^2-3(3x-3)+7x$ | 8. $4-3x^2-9x^3 = x^2(2x^2-2x)-8x$ | 9. $6x^4-x^3(3x-3)-5x^3 = 3x^2-2x$ |
| 10. $2(x^3+3x)-9x^3-3x = 3x^4-7x^2$ | 11. $3x(x^3-2x)+17x^2-6 = 13x^3-5x$ | 12. $3x^2-2x^2(x+3)+18x = 5x^3-2x^4$ |
| 13. $5x^4-x^3(3x+3)+x+6 = 8x^2-2x^3$ | 14. $2x^3(x-1)+x^4+9x^3-12x+8 = 6x^2$ | 15. $2x(x+3)+14x^2-18 = 2x^4-x^3+3x$ |
| 16. $x^3(x-2)-4x^4+x^3+29x^2 = 18-9x$ | 17. $3(3x^2-2x)+3x^3+3x = 11x^2-2x^4$ | 18. $3(2x+2)-3x^4+6x^2-9 = 14x-8x^3$ |
| 19. $12x^2-2(2x^3+3x)-2x^4 = 3x-3x^3$ | 20. $10x^3+19x^2-8x = 3x^2(x^2+2x)+12$ | 21. $9x^3-3(2x^2-x)+5x^2-24x = 2x^4+9$ |
| 22. $6-2x^2(x-2)-15x^2 = 3x^4+11x^3-5x$ | 23. $10x^2-2x^4-3x^2(3x-3) = 9-9x-8x^3$ | 24. $3x^3(3x+1)-11x^4+4x^3-16x = x^2-12$ |

5. Resuelve la ecuación:

[Grado 4-B]

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|---|---|---|
| 1. $3x^2-7x^3-3x(x-3)-8x = 6x^4$ | 2. $11x^3-2x^2(3x^2-3x) = 6x-5x^2$ | 3. $2x-19x^3-3x^4 = 3(x^4-2x^3)+x^2$ |
| 4. $24x^2-6x^4-12 = x(x-2)+x^3+6x$ | 5. $18x-9x^2-5x^4 = x^3(x+3)+20x^3$ | 6. $3x^2(x+1)+8x^3-3 = 6x^4-18x^2-x$ |
| 7. $x^2(3x+1)-6x^4-16x^3+13x^2 = 3x$ | 8. $9x-7x^3-12x^2-7 = 3(2x-3)-6x^4$ | 9. $3x^2(2x^2+3x)-10x^4-x^3-3x = x^2$ |
| 10. $4-7x^4-25x^2-2x(x^3-x^2) = 32x^3$ | 11. $7x^2-8x^3-3x^3(x+3)+8x = 4-9x^4$ | 12. $7x^3-6x^4-2 = 2(2x^3-1)-20x^2+12x$ |
| 13. $17x^2-2x^3(2x-2)-5x-3 = 2x^4-9x^3$ | 14. $6x^4-2(3x^3+x)+13x^3+6 = 18x^2+11x$ | 15. $23x-2x^3(x-2)-15x^3-12x^2 = 6-8x^4$ |
| 16. $15x^4-26x^3-3x = 3(3x^4-3x^3)-14x^2$ | 17. $3(2x-2)+6x^4-31x^3+75x = 48-18x^2$ | 18. $12-6x^4-14x^3-21x^2 = 3x^2(3x-1)-8$ |
| 19. $5x^3-6x^4-12 = 13x-13x^2-3x(2x^2-1)$ | 20. $2x^2(2x^2+3)-39x^2+36x+27 = 10x^3$ | 21. $17x^2-6x^4+51x = x(2x^2+x)+17x^3+18$ |
| 22. $11x^3-4x^4-x^2(3x+3)+26x^2 = 27x+18$ | 23. $x^3(2x+2)-8x^4-43x^3-18 = 94x^2+81x$ | 24. $3x^2(3x-2)+6x^4-17x^2+20x = 14x^3+4$ |



6. Resuelve la ecuación:

[Grado 4-C]

1. $21x - x^4 - 3x(x-3) = x^2 - x^3$
2. $x(x+3) - x^4 - 16x = 5x^3 + 18x^2$
3. $x(x^2 - 3x) + 4x^2 + 10x = x^3 - x^4$
4. $29x - 14x^2 - x(2x-1) = x^4 - 5x^3$
5. $x^4 - 2x^2(2x+1) + 5 = 12x - 12x^2$
6. $x^3(3x-3) - 2x^4 + 3x^2 = 78 - 37x$
7. $78 - x^2 - x^4 = 2x^2(x+1) + x^3 - 37x$
8. $x^4 - x(x+2) - 5x^3 + 17x^2 - 28x = 0$
9. $3(3x^2 - 2x) - x^4 - 7x = 5x^3 + 26x^2$
10. $x^4 + 9x^3 - 9x^2 = 2x^2(3x-2) + 39x$
11. $2(x^2 + 3x) - x^4 - x^3 - 5x^2 = 26 - 25x$
12. $3x(3x-2) + x^4 - 4x^3 + 2x = 3x^2 + 15$

7. Resuelve la ecuación:

[Grado 3-A]

1. $\frac{x(7x^2+3)}{10} + \frac{x^2(x+1)}{2} = x^3$
2. $\frac{x^2+3x-2}{8} + \frac{x(x^2+2)}{4} = x^2$
3. $\frac{x(5x+1)}{3} + \frac{3x^2(x-1)}{2} = 2x^3$
4. $\frac{x^3+2x^2}{2} - x^3 = 2x - \frac{5x^2+4}{6}$
5. $\frac{3x^2(x+1)}{4} - \frac{7x^3+3x-2}{12} = x^2$
6. $\frac{x^2(x+1)}{2} - \frac{5x^3-8x-12}{6} = x^2$
7. $\frac{x(2x^2-3)}{2} - \frac{x(4x^2-5x-8)}{6} = 1$
8. $\frac{x^2(x-2)}{3} - \frac{x(4x^2-x+9)}{6} = x^2$
9. $\frac{x+x^3}{2} - \frac{1-x^2}{8} + \frac{3x^3-3x^2}{4} = x^3$
10. $x^3 - \frac{x(10x^2+5x-6)}{24} = \frac{x^2(x-1)}{2}$
11. $x^3 + x - \frac{x(2x^2+x+9)}{24} = \frac{x(2x^2+1)}{2}$
12. $\frac{x(2x^2+1)}{8} - \frac{9x^3-7x^2-9}{24} - x^2 = x$
13. $\frac{3x^3+2x^2}{6} - \frac{7x^3+5x^2-3x}{18} - 1 = x$
14. $\frac{x(2x^2+3)}{4} - x^2 - \frac{x(x^2-x-4)}{8} = 2x$
15. $\frac{x^3+13x^2}{8} + \frac{x^3-1}{2} - \frac{13x-7}{8} = x^3$
16. $\frac{x^3-x^2}{5} - \frac{4x^3+5x^2}{30} - \frac{5x-9}{15} + x = 1$
17. $\frac{x^2(x+3)}{9} - \frac{x(x^2-21x-25)}{27} - x^2 = x$
18. $\frac{x^3+3}{2} - \frac{x(x^2+2)}{6} + \frac{x^2+1}{2} = 2+x^2$
19. $\frac{x^2(2x+3)}{3} = x^3 + x^2 - \frac{x(x^2+7x-2)}{12}$
20. $x^3 - \frac{13x^2+17x}{20} - \frac{2x^3+x}{2} - \frac{x^3-1}{10} = 1$
21. $x+x^3 - \frac{x(10x^2-x+16)}{18} = \frac{x^2(3x-2)}{9}$
22. $x^3 - \frac{x^3+7x^2}{12} - \frac{2x^3-2x^2}{3} = x - \frac{x+1}{3}$
23. $\frac{x^2(3x-2)}{3} - 1 = \frac{7x^3-3}{6} - \frac{x(13x+1)}{12}$
24. $x^3 - \frac{x^2(2x+1)}{4} - \frac{x(6x^2+x+6)}{8} + x = 0$

8. Resuelve la ecuación:

[Grado 3-B]

1. $\frac{x^2+10x+3}{12} - \frac{x^3-2x^2}{2} = x^2$
2. $x^2 - \frac{x(11x-3)}{16} = \frac{x(3x^2+2)}{8}$
3. $\frac{3x^2-2}{3} - \frac{5x^2-8x-7}{6} = 2x^3$
4. $\frac{4x^2+13x}{6} - \frac{2x^3-x^2}{3} - x^2 = 1$
5. $x^2 - \frac{x(x^2-2)}{2} = 2x - \frac{x^2(9x-1)}{6}$
6. $\frac{x^2(x+1)}{2} - x^3 = x^2 - \frac{5x^2+5x+2}{12}$
7. $x^2 - \frac{24x^2+x+2}{27} - \frac{x^2(x-1)}{3} = 0$
8. $x^3 - \frac{14x^3-2x^2+1}{30} - \frac{2x^3-x^2}{6} = 0$
9. $1 - \frac{x^3+14x^2}{12} - \frac{x^3-2x^2}{4} = \frac{1-5x}{4}$
10. $\frac{x^2(x+3)}{2} - 2x = 1 - \frac{x(3x^2-8x+1)}{6}$
11. $\frac{x^2(x+1)}{9} - \frac{x(8x^2+7x+3)}{18} = -2x+1$
12. $\frac{x-6}{9} - x = \frac{x^2(x+2)}{2} - \frac{5x^2(3x+5)}{18}$
13. $x - \frac{4x^2(5x-1)}{24} + \frac{x^2(2x-1)}{3} = \frac{x+3}{8}$
14. $x^3 - \frac{x^2(x+1)}{2} - \frac{x(2x^2-7x+2)}{16} = 0$
15. $2x^3 - \frac{x^2(3x-2)}{4} - \frac{x(x^2-x+2)}{8} = x^2$
16. $\frac{9x^2+1}{12} - x^2 + x - \frac{5x^3+15x}{24} = \frac{x^3+x}{6}$
17. $\frac{2x^3-x^2}{2} - \frac{20x^2-2x+3}{6} - 2x^3 = 3x$
18. $\frac{3x^3-x^2}{2} - \frac{14x^3-5x}{12} - \frac{1-x^2}{2} = x^2-1$
19. $x^3 - \frac{x^2(13x-2)}{27} - \frac{2x^2(x+1)}{3} = \frac{x-1}{3}$
20. $\frac{2x^3-x^2}{2} - \frac{x^2-9}{16} - \frac{5x^3-x}{8} = -x^2+2x$
21. $2x^2 - \frac{x^2(2x+1)}{3} = 1 - \frac{x(6x^2-7x-9)}{8}$
22. $\frac{x^2(x+1)}{2} - \frac{10x^3+3x^2-12}{8} = 4x-3x^2$
23. $x^3 - \frac{x(6x^2+10x-1)}{27} = \frac{x^2(3x+2)}{3} - x^2$
24. $\frac{x^2(2x+1)}{3} - x^3 = x^2 - \frac{x(16x^2+21x-1)}{30}$

9. Resuelve la ecuación:

[Grado 3-C]

1. $\frac{x-2x^3}{5} - \frac{14x+3x^2-3x^3}{10} = 1$
2. $\frac{x^3-x^2}{2} - \frac{9x^3-7x^2}{16} = 1 - \frac{x+1}{16}$
3. $x^3 - \frac{14x^3-11x+15}{30} = \frac{3x^3+x^2}{6}$



$$4. \frac{x^2(x+1)}{3} + \frac{x(11x^2-4x-5)}{18} = x^3$$

$$5. \frac{x^2(x-1)}{4} - \frac{x^2(5x+1)}{16} = \frac{7x+3}{16} - 1$$

$$6. \frac{x(5x^2+6x+13)}{24} - \frac{x(3x^2+1)}{12} = x$$

$$7. \frac{2x+1}{6} - x - \frac{x^2(x+3)}{6} = 1 - \frac{x^2(x+7)}{12}$$

$$8. \frac{3x^3+2x^2+2x}{5} + \frac{3x^3-x^2}{2} - 2x^3 = 3$$

$$9. \frac{3(9x+1)}{16} - \frac{x(x^2+1)}{2} = 1 - \frac{x^2(9x-7)}{16}$$

$$10. \frac{1-7x}{6} - 1 = \frac{x^2(2x+1)}{3} - \frac{x^2(3x-1)}{6}$$

$$11. \frac{x^2(3x-1)}{12} - \frac{x^2(7x-2)}{24} = 1 - \frac{3x-2}{12}$$

$$12. \frac{x^2(3x-2)}{3} - \frac{x(19x^2+4x-8)}{18} = -x^2+x$$

10. Resuelve la ecuación:

[Grado 4-A]

$$1. x^3 - \frac{9x^3+19x^2-36}{16} = \frac{x^4-3x^3}{8}$$

$$2. x^3 - \frac{x^4+x^3}{2} = 2x - \frac{7x^4-6x^2-8}{10}$$

$$3. \frac{x^4+x^2}{5} - \frac{11x^3+x^2}{10} = \frac{9-15x}{10} - x^2$$

$$4. \frac{2x^3(x+1)}{3} - \frac{x(x^3-13x-6)}{6} = 3x^3$$

$$5. 3x^3 - \frac{x^3(x+3)}{3} - \frac{x^2(x+20)}{6} = -2x$$

$$6. \frac{x(14x^3+9x^2+9)}{24} - \frac{x^3(2x-1)}{3} = x^3$$

$$7. \frac{x^4-x^3}{2} - \frac{11x^4-20x^2}{18} - 1 = \frac{9x-4x^3}{6}$$

$$8. x^4 - \frac{22x^3-41x^2+36}{12} - x = \frac{3x^4-2x^2}{4}$$

$$9. x^4 - \frac{x^4+3}{4} - \frac{x^3+17x}{8} = \frac{2x^4-3x^3}{4} + x^2$$

$$10. \frac{x^2(2x^2+3)}{3} - \frac{7x^3-63x-54}{6} = x^4 - x^2$$

$$11. \frac{x^2(3x+19)}{8} + \frac{x^3(3x-1)}{4} - \frac{9(x+1)}{8} = x^4$$

$$12. \frac{x^4-2x^3}{3} - \frac{3x^3-2x^2-27x}{6} - x^2 = 3$$

$$13. \frac{x+6}{18} - \frac{x(x^3+3)}{6} - x^3 = 1 - \frac{5x^2(x^2+x+5)}{8}$$

$$14. \frac{-7x^2-33x}{9} = 2 + \frac{2x^4+x^3}{9} - \frac{9x^4+14x^3}{27}$$

$$15. \frac{x^3(1-x)}{10} = x + \frac{11x^3+6}{10} - \frac{x^2(5x^2+41)}{20}$$

$$16. \frac{x(22x^3+21x^2-1)}{24} + \frac{x^3(2x+3)}{12} - x^4 = x^3$$

$$17. \frac{x^3(2x-1)}{15} - \frac{x^3(2x-9)}{30} - \frac{3x^2-x-9}{10} = x$$

$$18. x^4 - 1 - \frac{x^4-3}{6} - \frac{x(x^2+7x+7)}{3} = \frac{x^2(x^2+1)}{3}$$

$$19. \frac{x^4-x^3}{2} - x^3 - \frac{4x^4-40x^2}{12} = \frac{-x^3+15x-6}{4}$$

$$20. x^4 + \frac{13x^2+2}{2} - \frac{x(22x^2+29)}{6} = \frac{x^3(x-1)}{2}$$

$$21. x^4 - \frac{2x^4+3x^3}{3} - \frac{9x^4+x^2}{18} = \frac{-13x^3+4x-2}{9}$$

$$22. x^4 - \frac{x^2(16x^2+34x-9)}{27} - \frac{x^3(x-3)}{3} = \frac{5x-1}{27}$$

$$23. \frac{x^4-3x^3}{4} - \frac{7x^3-7x^2}{16} + x^3 + x = \frac{3x^4+2x-2}{8}$$

$$24. \frac{27x-27}{8} - \frac{x^4-2x^3}{2} = 2x^3 - \frac{2x^4+x^3+9x^2}{8}$$

11. Resuelve la ecuación:

[Grado 4-B]

$$1. 1 - \frac{31x^2+2}{6} - \frac{x^2(3x^2-2)}{2} = 5x^3$$

$$2. \frac{x^3(3x+1)}{2} - \frac{x(21x^3-17x-6)}{10} = x^3$$

$$3. 2x^4 - \frac{x(13x^2+5x-6)}{6} = \frac{x^3(3x+2)}{3}$$

$$4. \frac{x^3(1-x)}{3} - x^4 = x^2 - \frac{x(2x^3+9x^2+1)}{6}$$

$$5. \frac{2x^2(x^2+1)}{3} - \frac{x(12x^3-2x^2-9)}{27} = x^3$$

$$6. \frac{x^4+x^3}{2} - x^3 = \frac{x^4+5x^2+1}{4} - \frac{x^3+29x}{24}$$

$$7. \frac{x^4-3x^2}{3} - \frac{-23x^3-34x^2}{27} - \frac{x^4+3}{9} = x$$

$$8. x^3 - \frac{2x^4-9x^2+3}{4} - \frac{x^3+7x}{8} = \frac{x^4+3x}{4}$$

$$9. \frac{16x-6}{5} = x^3 - \frac{3x^4-2x^2}{5} - \frac{3x^3-15x^2}{10}$$

$$10. x^4 - \frac{x^4+20x+6}{8} - \frac{19x^2-7x^3}{16} = \frac{x^4-x}{2}$$

$$11. 2x^2 - \frac{2x^4-x^3}{5} - \frac{2x^4+3x^2+3}{10} = \frac{3x^3-x}{2}$$

$$12. 3x - \frac{x+6}{9} - \frac{3x^4+31x^2}{18} + \frac{2x^4-2x^2}{3} = x^3$$

$$13. \frac{3x^3-x^4}{5} - \frac{7x^4+101x^2}{10} - \frac{32x+6}{5} = 6x^3$$

$$14. \frac{2x^4+3x^3}{4} - \frac{22x^3-32x^2}{12} - \frac{6-15x}{4} = x^4$$

$$15. x^2 - \frac{4x^2+3}{15} - \frac{3x^4-5x^3-11x}{30} = \frac{x^4+2x^3}{10}$$

$$16. \frac{x^4+x^3}{3} - \frac{5x^4-7x^2+1}{6} = 2x^3 - x^4 - \frac{x^3+x}{12}$$

$$17. \frac{2x^4-3x^3}{9} - \frac{8x^3-14x^2}{27} - \frac{4x^4-3}{9} = -x+1$$

$$18. \frac{x^4+x^3}{2} - \frac{49x^3+98x^2}{12} - \frac{25x-2}{4} - x^4 = 2$$

$$19. \frac{4x+3}{18} + \frac{x^3(x+3)}{6} = x - \frac{x^2(x^2-25x+23)}{18}$$

$$20. 2x - \frac{x^4-6}{5} - \frac{15x^3-3x^2}{10} = x^2 + \frac{2x^4+2x^3}{5}$$

$$21. \frac{x+1}{8} + \frac{x^3(x+2)}{4} = x^3+x^2 - \frac{x^2(4x^2+3x+1)}{8}$$

$$22. \frac{3(5x+2)}{10} - x^3 = \frac{x^3(2x-3)}{5} - \frac{x^2(8x^2+13)}{30}$$

$$23. \frac{2x^4-1}{6} - \frac{x^4+7x^2-1}{30} - \frac{x(6x^2-7)}{15} = -x^3+x$$

$$24. \frac{x^3(x-1)}{8} - \frac{3x(x+15)}{16} = \frac{3x^4+x^3-9}{8} - x^3-x^2$$

12. Resuelve la ecuación:

[Grado 4-C]



$$1. x^3 - \frac{x^3+3}{6} + 3 = \frac{x^4-7x}{3} - \frac{x^4-x^3}{2}$$

$$2. x^4 - \frac{x^3(2x+3)}{2} - \frac{x^4-15x^3+39}{10} = 4x$$

$$3. \frac{x^3(2x-1)}{4} - \frac{x^3(9x-2)}{16} - 2x = \frac{3x^2+20}{8}$$

$$4. \frac{x^4+3x^3}{4} - \frac{3x^4+3}{8} + 6 = \frac{2x^3-2x^2+9}{4}$$

$$5. \frac{12-13x}{27} - \frac{3x^4+x^3}{9} = 1-x - \frac{8x^4+5x^3}{27}$$

$$6. \frac{3x^4-x^3}{2} - \frac{21x^2-11x^3}{10} - \frac{8x^4-23x}{5} = 3$$

$$7. \frac{3x^4+2x}{10} - \frac{7x^4+4x^3-4x}{20} - \frac{2x^2+1}{4} = x$$

$$8. \frac{x^3(2x+1)}{8} - \frac{2-13x}{6} + 2 = \frac{x^2(3x^2-x-1)}{16}$$

$$9. \frac{x^2(2x-3)}{8} = \frac{x^3(3x-2)}{8} - 3x+3 - \frac{5x^4+3}{16}$$

$$10. \frac{x^3(2x+1)}{4} - \frac{x^3(5x-1)}{8} = x^2 - \frac{x^2-x+30}{4}$$

$$11. x^4+x^3 - \frac{x^3(x-1)}{2} = \frac{x^4-13}{3} - \frac{3x(11x+17)}{6}$$

$$12. \frac{x^4+2x^3}{3} - \frac{9x^4-9x^2}{30} - \frac{26-8x-3x^3}{5} = x^3$$

13. Resuelve la ecuación:

[Grado 3-A]

$$1. \frac{20}{x+3} + \frac{8}{x-3} + 3x = 4$$

$$2. \frac{2}{x-1} - \frac{x+7}{x^2-1} - 2x = 5$$

$$3. \frac{8-11x-x^2}{x^2-2x+1} - 2x = 8$$

$$4. \frac{1}{x-2} - \frac{x+17}{x^2-4} - 2x = 3$$

$$5. 2 - \frac{x^2-15x-10}{x^2+2x+1} = 3x$$

$$6. 11 - \frac{8}{x+1} - \frac{x-3}{x^2-1} = 3x$$

$$7. 4-2x - \frac{x^2-6x+7}{x^2-4x+4} = 0$$

$$8. -3x - \frac{4}{x+2} - \frac{x+33}{x^2-4} = 7$$

$$9. 2x - \frac{5}{2x-2} - \frac{3}{2x+2} = 1$$

$$10. -3x - \frac{8}{x+2} - \frac{x+22}{x^2-4} = 2$$

$$11. 8 - \frac{x^2+20x+29}{x^2+4x+4} = 2x$$

$$12. 12 - \frac{x^2+19x+12}{x^2+2x+1} = 3x$$

$$13. 8 - \frac{x^2+6x+4}{2x^2} + \frac{1}{2} = 3x$$

$$14. 2x - \frac{x^2-43x-48}{x^2+4x+4} = 12$$

$$15. \frac{1}{4} - \frac{x^2+6x-3}{4x^2+8x+4} = 2x+7$$

$$16. \frac{10}{2x+3} + \frac{1}{2x-3} + 2x = 3$$

$$17. \frac{x^2+41x+48}{x^2+4x+4} + 2x = 12$$

$$18. 7 - \frac{13}{x+2} - \frac{x+2}{x^2+3x} = 3x$$

$$19. \frac{22}{3x-1} - \frac{x-23}{9x^2-1} = -2x+9$$

$$20. 1 - \frac{2x^2+x+16}{8x^2-12x} = 6x - \frac{1}{4}$$

$$21. 13 - \frac{x+33}{2x^2+3x} + \frac{19}{x} = 6x$$

$$22. \frac{40-23x-x^2}{x^2-4x+4} - 2x = 10$$

$$23. \frac{1}{3} - \frac{x^2+12x-12}{3x^2} - 2x = 7$$

$$24. \frac{35}{9x-3} - 1 - \frac{3x-43}{27x^2-3} = 2x$$

14. Resuelve la ecuación:

[Grado 3-B]

$$1. \frac{3}{4x+8} - \frac{9}{4x} - 2x = 6$$

$$2. 13 - \frac{x+4}{2x^2} - \frac{1}{2x} = 6x$$

$$3. 7 - \frac{2}{x-1} - \frac{x-9}{x^2-1} = 6x$$

$$4. 2 - \frac{x^2+22x-8}{x^2-4} = 6x$$

$$5. \frac{1}{3x} - \frac{x-12}{3x^2} - 6x = 13$$

$$6. -6x - \frac{15}{x} - \frac{x+3}{x^2} = 23$$

$$7. 11 - \frac{1}{x-1} - \frac{x-8}{x^2-1} = 6x$$

$$8. 6x - \frac{11}{2x} = 17 - \frac{x+12}{2x^2}$$

$$9. -6x - \frac{6}{x+1} - \frac{x+11}{x^2-1} = 5$$

$$10. 8 - \frac{x^2+21x-32}{x^2-4} = 6x$$

$$11. 6x - \frac{2}{2x+1} - \frac{15}{2x-1} = 1$$

$$12. 6x = 20 - \frac{x^2+7x-14}{x^2-1}$$

$$13. -\frac{8}{x-1} - \frac{x+3}{x^2-1} - 6x = 11$$

$$14. -6x - \frac{x^2-15x-6}{x^2-1} = 12$$

$$15. 11 - \frac{x+20}{10x^2} = 6x - \frac{31}{10x}$$

$$16. 18 - \frac{x^2+31x+18}{x^2+2x+1} = 6x$$

$$17. 6x - \frac{x+47}{x^2-4} - \frac{5}{x+2} = 7$$

$$18. -6x - \frac{26}{x-2} - \frac{x-8}{x^2-4} = 11$$

$$19. 6x - \frac{x^2-30x+48}{x^2-4} = 12$$

$$20. 11 - \frac{x^2-6x+4}{2x^2} = 6x - \frac{1}{2}$$

$$21. \frac{19}{2x} - \frac{2x-31}{4x^2-2x} - 3x = 1$$

$$22. \frac{1}{2} - \frac{2x^2+x+12}{4x^2+6x} - 3x = 8$$

$$23. 1 - \frac{35}{9x+9} - \frac{x+26}{9x^2-9} = 6x$$

$$24. 6x - \frac{1}{x-1} - \frac{13x-21}{x^2-2x+1} = 13$$

15. Resuelve la ecuación:

[Grado 3-C]

$$1. 1 - \frac{8}{3x} - \frac{x+15}{3x^2} = x$$

$$2. 5 - \frac{20}{x+2} - \frac{x+7}{x^2-4} = x$$

$$3. \frac{4}{x+1} - \frac{30}{x-1} - x = 8$$

$$4. -x - \frac{10}{x-1} - \frac{x-8}{x^2-1} = 2$$

$$5. 6-x - \frac{13}{x-1} - \frac{x-19}{x^2-1} = 0$$

$$6. -x - \frac{26}{3x} - \frac{4}{3x+9} = 5$$

$$7. 2 - \frac{x+18}{4x^2-1} - \frac{20}{2x+1} = x$$

$$8. -x - \frac{8}{x-2} - \frac{x-5}{x^2-2x} = 3$$

$$9. -\frac{x+12}{x^2-4} - \frac{19}{x-2} - x = 5$$

$$10. 2 - \frac{x+13}{9x^2-1} - \frac{15}{3x+1} = x$$

$$11. x - \frac{1}{2} = 3 - \frac{x^2+18x+26}{2x^2}$$

$$12. \frac{1}{4} - \frac{x^2+18x+49}{4x^2+8x+4} - x+2 = 0$$



16. Resuelve la ecuación:

[Grado 3-Falsas]

1. $5 - \frac{x-3}{x^2-x} + \frac{3}{x} = 2x$
2. $\frac{2}{x-1} - \frac{x+3}{x^2-1} - 3x = 5$
3. $3 - \frac{9}{x} - \frac{x-27}{x^2+3x} = 2x$
4. $4 - \frac{7}{x-2} - \frac{x-30}{x^2-4} = 3x$
5. $\frac{7}{4x+6} - \frac{x+24}{4x^2-6x} = x$
6. $\frac{13}{2x-3} - \frac{x+18}{2x^2-3x} - x = 1$
7. $7 - \frac{x+6}{x^2+2x} - \frac{2}{x+2} = 2x$
8. $\frac{7}{4x+2} - \frac{2x-13}{8x^2-2} - 2x = 1$
9. $1 - \frac{1}{4x+6} - \frac{2x+9}{8x^2-18} = 2x$
10. $4 - \frac{4}{x} - \frac{x-8}{x^2+2x} = 4x$
11. $\frac{2}{x+1} - \frac{x-1}{x^2+x} + 6x = 5$
12. $12 - \frac{14}{x-1} - \frac{x-29}{x^2-1} = 4x$
13. $\frac{4}{9x-6} - \frac{3x+14}{27x^2-12} = x$
14. $\frac{4}{3x+1} - \frac{x-1}{3x^2+x} - 2x = 1$
15. $3x - \frac{5}{2x-1} = 5 - \frac{x+2}{2x^2-x}$
16. $7 - \frac{13}{4x-2} - \frac{2x-27}{8x^2-2} = 6x$
17. $\frac{9}{4x-2} - \frac{x+4}{4x^2-2x} = 3x+1$
18. $2x - \frac{19}{9x+6} = 3 - \frac{x-12}{9x^2+6x}$
19. $7 - \frac{19}{x} - \frac{x-19}{x^2+x} = x$
20. $1 - \frac{3}{x+1} - \frac{x+7}{x^2-1} = x$
21. $x + \frac{12}{x-1} = 6 - \frac{x-13}{x^2-x}$
22. $x - \frac{18-x}{x^2-4} + \frac{4}{x-2} = 0$
23. $-x - \frac{4}{x+3} - \frac{x+15}{x^2+3x} = 2$
24. $4 - \frac{12}{x} - \frac{x-24}{x^2+2x} = x$

17. Resuelve la ecuación:

[Grado 4-A]

1. $5x - \frac{x-3}{x^2} - 2x^2 - \frac{4}{x} = 1$
2. $18 - 2x^2 - \frac{5}{x} - \frac{x+31}{x^2+x} = x$
3. $2x^2 - \frac{2}{x+1} - \frac{15}{x-1} + x = 13$
4. $\frac{6}{x} - \frac{3}{2x+3} - x^2 - 6x = 8$
5. $9x - \frac{41}{2x} - 2x^2 - \frac{x+18}{2x^2} = 1$
6. $6 - \frac{10}{2x+3} - \frac{x+6}{2x^2+3x} = x^2$
7. $6 - \frac{x+15}{5x^2} + \frac{41}{5x} = 3x^2 + 8x$
8. $7 - \frac{12}{x-1} - \frac{x-19}{x^2-1} = 2x^2 - 5x$
9. $3x^2 - \frac{24}{x-1} - \frac{12}{x} + 11x = 4$
10. $9x - \frac{14}{x} - 2x^2 - \frac{x+1}{x^2-2x} = 3$
11. $4x + 19 - \frac{31}{4x} - \frac{x+48}{4x^2} = 3x^2$
12. $\frac{21}{x+3} - \frac{x-4}{x^2+3x} = 3x^2 - x + 4$
13. $\frac{9}{2x} - \frac{7}{6x-4} = -3x^2 + 12x - 8$
14. $\frac{15}{x+2} + \frac{6}{x-2} - 3x^2 + 7x = 3$
15. $10x + 6 - \frac{29}{x+1} - \frac{x+11}{x^2-1} = 3x^2$
16. $2x^2 - x - \frac{19}{2x} = 9 - \frac{x-20}{2x^2-4x}$
17. $\frac{4}{x} - \frac{x+11}{x^2+2x} - 2x^2 + 3x = 1$
18. $5 + \frac{24}{x-2} - \frac{28-x}{x^2-4} = -3x^2 - 7x$
19. $3x^2 - 4x - \frac{7}{x-2} = 8 - \frac{x-3}{x^2-2x}$
20. $12x^2 - 2x - \frac{35}{6x+9} - \frac{8}{3x} = 5$
21. $\frac{19}{x+3} - \frac{x+2}{x^2+3x} - 2x^2 + 3x = 5$
22. $22 - \frac{15}{2x} - \frac{x+48}{2x^2-4x} = -3x^2 - 2x$
23. $11 - \frac{1}{x+1} - \frac{2(3x+5)}{x^2+2x+1} = 2x^2 - 3x$
24. $7 - \frac{42}{3x-2} - \frac{x+18}{3x^2-2x} = 3x^2 - 9x$

18. Resuelve la ecuación:

[Grado 4-B]

1. $\frac{16}{x+1} - \frac{18}{x} + 9x^2 = 79$
2. $\frac{7}{x-1} - \frac{x-2}{x^2-1} = 4x^2 - 9$
3. $17 - \frac{35}{2x+3} - \frac{4-x^2}{x} = 3x^2$
4. $\frac{6}{x+2} - \frac{1}{x} - 6x^2 - 7x = 8$
5. $14 + \frac{2}{x} - \frac{x+2}{x^2} = 6x^2 - 5x$
6. $8 - \frac{x^3-13x+8}{x^2-2x+1} = 6x^2 - x$
7. $7x + 3 - \frac{5}{2x} - \frac{x+2}{2x^2} = 6x^2$
8. $\frac{8}{x} - \frac{x-3}{x^2} - 6x^2 - 23x = 13$
9. $\frac{7}{6x+9} - \frac{2}{3x} - 6x^2 - 8x = 5$
10. $\frac{15}{x+1} - \frac{2}{x-1} = -4x^2 - 4x + 17$
11. $14 - \frac{42}{x+2} - \frac{5}{x-2} = 6x^2 - x$
12. $\frac{9}{4x} - \frac{x-12}{4x^2} - 4x^2 - 12x = 9$
13. $\frac{12}{x+1} - \frac{x-11}{x^2-1} - 6x^2 + 17x = 1$
14. $12x - \frac{x-26}{x^2-1} = 4x^2 + 1 + \frac{15}{x-1}$
15. $\frac{34}{3x} - \frac{x-18}{3x^2} - 6x^2 - 29x = 30$
16. $\frac{23}{x+2} - \frac{x+22}{x^2-4} - 6x^2 + 7x = 17$
17. $\frac{20}{x+1} - \frac{x-3}{x^2-1} - 6x^2 + 17x = 17$
18. $6x^3 - 23x + 22 = \frac{27}{x+1} - \frac{x-5}{x^2-1}$
19. $\frac{50}{x+2} - \frac{27}{x} - 6x^2 + 35x = 52$
20. $3x^2 + 7x - \frac{21}{2x+3} = 7 - \frac{12}{x+1}$
21. $9 - \frac{1}{x} - \frac{9(4x-1)}{x^2+x} = 6x^2 - 13x$
22. $-3x^2 - 4x - \frac{3}{x} - \frac{x+11}{2x^2-3x} = 2$
23. $6 - \frac{2x^2+3x+6}{4x^2+2x} + \frac{1}{2} = 3x^2 - x$
24. $\frac{8}{3x} - \frac{x+18}{6x^2+9x} - 6x^2 - 4x = 1$



19. Resuelve la ecuación:

[Grado 4-C]

$$1. -x^2 - 7 - \frac{x+26}{x^2-1} = \frac{19}{x+1}$$

$$2. \frac{32}{x} - \frac{x+26}{x^2} - x^2 - x = 3$$

$$3. 2x - \frac{15}{2x} - x^2 - \frac{x-40}{2x^2} = 1$$

$$4. 3x - \frac{3}{x-1} - \frac{x-31}{x^2-1} - x^2 = 2$$

$$5. x^2 - \frac{31-x}{4x^2-4} = -2 - \frac{39}{4x-4}$$

$$6. -x^2 - x - \frac{33}{x-2} - \frac{x-34}{x^2-4} = 8$$

$$7. x^2 + 4x + 5 = \frac{26}{3x} - \frac{16}{3x+9}$$

$$8. \frac{11}{x+3} - \frac{x+37}{x^2-9} - x^2 + 2x = 10$$

$$9. \frac{1}{3x} - \frac{x-47}{3x^2-6x} = x^2 - 2x + 2$$

$$10. x - \frac{15}{2x-4} - 7 = x^2 - \frac{13}{2x+4}$$

$$11. -x^2 - 5x - \frac{6}{x-2} - \frac{x+32}{x^2-4} = 11$$

$$12. \frac{1}{2} - \frac{x^2+x+40}{2x^2-6x} - x^2 + 2x = 12$$

20. Resuelve la ecuación:

[Grado 4-Falsas]

$$1. \frac{3}{x+1} - \frac{x-5}{x^2-1} = 2x^2 - x - 4$$

$$2. 4 - \frac{2}{x+1} - \frac{x+3}{x^2+x} = 2x^2 - x$$

$$3. \frac{2}{x-3} - \frac{x+3}{x^2-3x} = -2x^2 + 3x$$

$$4. \frac{9}{x} - \frac{x+18}{x^2+x} - 3x^2 + 5 = 10x$$

$$5. \frac{7}{2x-1} - \frac{x+3}{2x^2-x} - 3x+1 = x^2$$

$$6. \frac{41}{x} - \frac{x+41}{x^2+x} - 3x^2 + 17x = 34$$

$$7. 7x - \frac{17}{2x-2} - \frac{x-18}{2x^2-2x} = 2x^2$$

$$8. \frac{6}{x+2} - \frac{x-22}{x^2-4} - 2x^2 + 16 = x$$

$$9. 2x^2 - x - \frac{7}{3x-3} = 5 - \frac{x+6}{3x^2-3x}$$

$$10. 7 - \frac{1}{x-1} - \frac{x-2}{x^2-x} = 9x^2$$

$$11. \frac{3}{4x-6} - \frac{2x+15}{8x^2-18} = x^2$$

$$12. x^2 - \frac{7}{4x+6} = 1 - \frac{2x-39}{8x^2-18}$$

$$13. 3 - \frac{2}{x+1} - \frac{x+5}{x^2-1} = 4x^2 - 8x$$

$$14. \frac{7}{x+1} - \frac{x-6}{x^2+x} - 4x^2 - 12x = 5$$

$$15. 8x - 4x^2 - \frac{2}{x+3} - \frac{x+9}{x^2+3x} = 1$$

$$16. 6x^2 + 7x - \frac{24}{x+1} - \frac{x+49}{x^2-1} = 13$$

$$17. \frac{3}{x-3} - \frac{x+6}{x^2-3x} - 9x^2 + 5 = 6x$$

$$18. \frac{3}{2x+1} - \frac{x-1}{2x^2+x} - 3x^2 + 7x = 5$$

$$19. -x^2 - \frac{17}{x+1} - \frac{x+35}{x^2-1} = 8$$

$$20. \frac{10}{x} - \frac{x-10}{x^2-x} - x^2 + 3x = 11$$

$$21. \frac{17}{x-1} - \frac{x+33}{x^2-1} - x^2 - 4x = 3$$

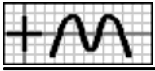
$$22. \frac{10}{x-2} - \frac{x+38}{x^2-4} - x^2 - 3x = 11$$

$$23. \frac{27}{x+1} - \frac{x-26}{x^2+x} - x^2 + 8x = 25$$

$$24. -x^2 - 3x - \frac{4}{x-3} - \frac{x-15}{x^2-3x} = 7$$

— Soluciones —

- 1.1. $-\frac{1}{2}, 1$ 1.2. $-\frac{1}{2}, 2$ 1.3. $-2, \frac{1}{3}, 2$ 1.4. $-3, 0, \frac{1}{3}$ 1.5. $-1, -\frac{2}{3}, 0$ 1.6. $-3, 0, \frac{1}{3}$ 1.7. $-3, 0, \frac{2}{3}$ 1.8. $-1, \frac{2}{3}, 1$ 1.9. $-3, \frac{2}{3}, 3$ 1.10. $-\frac{2}{3}, 0, 2$ 1.11. $-\frac{3}{2}, 0, 3$ 1.12. $-\frac{2}{3}, 0, 3$ 1.13. $-2, -\frac{1}{2}, 0$ 1.14. $-\frac{1}{2}, 0, 2$ 1.15. $-3, \frac{1}{2}, 1$ 1.16. $-1, 0, \frac{3}{2}$ 1.17. $-\frac{1}{3}, 0, 1$ 1.18. $-3, \frac{3}{2}$ 1.19. $-3, -2, \frac{1}{2}$ 1.20. $-\frac{1}{3}, 1, 2$ 1.21. $0, \frac{1}{2}, 2$ 1.22. $-1, \frac{3}{2}, 3$ 1.23. $-2, \frac{3}{2}$ 1.24. $-3, -\frac{1}{2}, 1$ 2.1. $-1, \frac{1}{3}, \frac{2}{3}$ 2.2. $-\frac{3}{2}, 0, \frac{1}{2}$ 2.3. $-\frac{3}{2}, -\frac{1}{2}, 2$ 2.4. $-\frac{2}{3}, -\frac{1}{3}, 0$ 2.5. $0, \frac{1}{3}, \frac{2}{3}$ 2.6. $-\frac{2}{3}, 0, \frac{1}{2}$ 2.7. $-1, -\frac{1}{3}, \frac{2}{3}$ 2.8. $0, \frac{1}{3}, \frac{2}{3}$ 2.9. $-\frac{1}{2}, 0, \frac{1}{3}$ 2.10. $-\frac{2}{3}, 0, \frac{3}{2}$ 2.11. $-\frac{1}{2}, \frac{1}{3}, 2$ 2.12. $-2, \frac{1}{3}, \frac{2}{3}$ 2.13. $-\frac{1}{3}, 0, \frac{2}{3}$ 2.14. $-\frac{3}{2}, -\frac{1}{2}, 3$ 2.15. $0, \frac{1}{3}, \frac{1}{2}$ 2.16. $-\frac{1}{2}, 0, \frac{3}{2}$ 2.17. $-\frac{1}{2}, \frac{2}{3}, 2$ 2.18. $-\frac{2}{3}, \frac{1}{2}, 1$ 2.19. $-2, -\frac{1}{3}, \frac{1}{2}$ 2.20. $0, \frac{1}{3}, \frac{2}{3}$ 2.21. $-\frac{1}{2}, -\frac{1}{3}, 3$ 2.22. $-\frac{3}{2}, \frac{1}{2}, 2$ 2.23. $-\frac{2}{3}, \frac{1}{3}, 2$ 2.24. $\frac{1}{3}, \frac{2}{3}, 1$ 3.1. -3 3.2. 0 3.3. 3 3.4. -1 3.5. -1 3.6. 3 3.7. -2 3.8. 3 3.9. 2 3.10. 3 3.11. 0 3.12. -3 4.1. $-3, -\frac{3}{2}, 0, 1$ 4.2. $-2, -1, \frac{1}{3}, 1$ 4.3. $-2, -\frac{1}{2}, 2$ 4.4. $-3, -\frac{1}{3}, 0, 1$ 4.5. $-2, -1, -\frac{2}{3}, 3$ 4.6. $-1, \frac{1}{2}, 1$ 4.7. $-2, -1, 0, \frac{1}{2}$ 4.8. $-2, -\frac{1}{2}, 1$ 4.9. $-1, 0, \frac{2}{3}$ 4.10. $-3, -\frac{1}{3}, 0, 1$ 4.11. $-\frac{2}{3}, 1, 3$ 4.12. $-\frac{3}{2}, 0, 2, 3$ 4.13. $-\frac{3}{2}, -1, 1, 2$ 4.14. $-2, \frac{2}{3}, 1$ 4.15. $-2, -\frac{3}{2}, 1, 3$ 4.16. $-3, -1, \frac{2}{3}, 3$ 4.17. $-\frac{3}{2}, -1, 0, 1$ 4.18. $-1, -\frac{1}{3}, 1, 3$ 4.19. $-3, 0, 1, \frac{3}{2}$ 4.20. $-2, -\frac{2}{3}, 1, 3$ 4.21. $-1, -\frac{1}{2}, 3$ 4.22. $-3, -1, \frac{2}{3}, 3$ 4.23. $-3, -1, \frac{1}{2}, 3$ 4.24. $-\frac{3}{2}, 1, 2$ 5.1. $-1, -\frac{1}{2}, 0, \frac{1}{3}$ 5.2. $-\frac{2}{3}, 0, \frac{1}{2}, 3$ 5.3. $-2, -\frac{1}{2}, 0, \frac{1}{3}$ 5.4. $-2, -\frac{2}{3}, 1, \frac{3}{2}$ 5.5. $-3, -\frac{3}{2}, 0, \frac{2}{3}$ 5.6. $-1, -\frac{1}{2}, \frac{1}{3}, 3$ 5.7. $-3, 0, \frac{1}{3}, \frac{1}{2}$ 5.8. $-1, -\frac{1}{3}, \frac{1}{2}, 2$ 5.9. $-\frac{1}{2}, 0, 1, \frac{3}{2}$ 5.10. $-2, -1, -\frac{2}{3}, \frac{1}{3}$ 5.11. $-\frac{2}{3}, \frac{1}{2}, 1, 2$ 5.12. $-2, 0, \frac{2}{3}, \frac{3}{2}$ 5.13. $-1, -\frac{1}{3}, \frac{1}{2}, 3$ 5.14. $-2, -1, \frac{1}{3}, \frac{3}{2}$ 5.15. $-\frac{3}{2}, \frac{1}{3}, 1, 2$ 5.16. $0, \frac{1}{3}, 1, \frac{3}{2}$ 5.17. $-\frac{3}{2}, \frac{2}{3}, 3$ 5.18. $-2, -\frac{1}{2}, \frac{2}{3}, 3$ 5.19. $-1, -\frac{2}{3}, \frac{3}{2}, 2$ 5.20. $-3, -\frac{1}{2}, \frac{3}{2}, 3$ 5.21. $-3, -2, \frac{1}{3}, \frac{3}{2}$ 5.22. $-2, -\frac{1}{2}, \frac{3}{2}, 3$ 5.23. $-3, -2, -\frac{3}{2}, -\frac{1}{3}$ 5.24. $-2, -\frac{1}{3}, \frac{1}{2}, 2$ 6.1. $0, 3$ 6.2. $-1, 0$ 6.3. $-2, 0$ 6.4. $0, 3$ 6.5. 1 6.6. $-3, 2$ 6.7. $-2, 3$ 6.8. $0, 3$ 6.9. $-1, 0$ 6.10. $0, 3$ 6.11. $1, 2$ 6.12. $-1, 3$ 7.1. $-\frac{3}{2}, -1, 0$ 7.2. $\frac{1}{2}, 1, 2$ 7.3. $-\frac{2}{3}, 0, 1$ 7.4. $\frac{2}{3}, 1, 2$ 7.5. $-1, \frac{1}{2}, 2$ 7.6. $-2, -\frac{3}{2}, 2$ 7.7. $-2, -\frac{3}{2}, 1$ 7.8. $-3, -\frac{3}{2}, 0$ 7.9. $\frac{1}{2}, 1$ 7.10. $-2, -\frac{3}{2}, 0$ 7.11. $-\frac{3}{2}, 0, 1$ 7.12. $-3, \frac{1}{3}$ 7.13. $-2, -\frac{3}{2}, 3$ 7.14. $-\frac{2}{3}, 0, 3$ 7.15. $\frac{1}{3}, 1, 3$ 7.16. $\frac{3}{2}, 2$ 7.17. $-2, 0, \frac{1}{2}$ 7.18. $-\frac{1}{2}, 0, 2$ 7.19. $0, \frac{1}{3}, 2$ 7.20. $-3, -2, -\frac{3}{2}$ 7.21. $-2, -\frac{1}{2}, 0$ 7.22. $-2, \frac{2}{3}, 1$ 7.23. $-1, \frac{3}{2}, 2$ 7.24. $-2, 0, \frac{1}{2}$ 8.1. $-1, -\frac{1}{3}, \frac{3}{2}$ 8.2. $0, \frac{1}{3}, \frac{1}{2}$ 8.3. $-\frac{3}{2}, -\frac{1}{3}, 1$ 8.4. $-2, \frac{1}{2}, \frac{3}{2}$ 8.5. $-\frac{3}{2}, 0, \frac{2}{3}$ 8.6. $-\frac{2}{3}, -\frac{1}{2}, 1$ 8.7. $-\frac{1}{3}, \frac{2}{3}, 1$ 8.8. $-1, -\frac{1}{2}, \frac{1}{3}$ 8.9. $-3, -\frac{1}{2}, \frac{3}{2}$ 8.10. $-1, -\frac{2}{3}, \frac{3}{2}$ 8.11. $-3, \frac{2}{3}, \frac{3}{2}$ 8.12. $-2, -\frac{2}{3}, \frac{3}{2}$ 8.13. $-3, \frac{1}{2}, \frac{3}{2}$ 8.14. $-\frac{1}{2}, 0, \frac{2}{3}$ 8.15. $-\frac{1}{3}, 0, \frac{2}{3}$ 8.16. $-1, -\frac{1}{3}, \frac{2}{3}$ 8.17. $-3, -\frac{1}{2}, -\frac{1}{3}$ 8.18. $-\frac{1}{2}, \frac{3}{2}, 2$ 8.19. $-3, -\frac{3}{2}, \frac{1}{2}$ 8.20. $-3, \frac{1}{3}, \frac{3}{2}$ 8.21. $-\frac{2}{3}, \frac{3}{2}, 3$ 8.22. $\frac{2}{3}, \frac{3}{2}, 2$ 8.23. $-\frac{1}{2}, 0, \frac{1}{3}$ 8.24. $-\frac{1}{2}, 0, \frac{1}{3}$ 9.1. -1 9.2. -3 9.3. 3 9.4. 0 9.5. 1 9.6. 0 9.7. -1 9.8. 3 9.9. 1 9.10. -1 9.11. -2 9.12. 0 10.1. $-3, -\frac{3}{2}, 2$ 10.2. $-2, -\frac{1}{2}, 2$ 10.3. $-1, \frac{1}{2}, 3$ 10.4. $-\frac{1}{3}, 0, 2, 3$ 10.5. $0, \frac{3}{2}, 2$ 10.6. $-3, -\frac{3}{2}, 0, 1$ 10.7. $-3, -\frac{1}{2}, 2, 3$ 10.8.



- $-\frac{2}{3}, 2, 3$ 10.9. $-3, -1, \frac{-1}{2}, 2$ 10.10. $-3, -2, \frac{-3}{2}, 3$ 10.11. $-3, \frac{-1}{2}, 1, 3$ 10.12. $-2, 1, \frac{3}{2}, 3$ 10.13. $\frac{-1}{2}, 2, 3$ 10.14. $-3, \frac{-2}{3}, 3$ 10.15. $\frac{-1}{3}, 2, 3$ 10.16. $-1, 0, \frac{1}{2}$ 10.17. $-3, 1, \frac{3}{2}$ 10.18. $-1, \frac{-1}{3}, 3$ 10.19. $1, \frac{3}{2}, 2, 3$ 10.20. $\frac{1}{3}, 1, 2, 3$ 10.21. $-1, \frac{2}{3}, 1, 2$ 10.22. $\frac{1}{2}, 1$ 10.23. $-2, -1, \frac{-1}{2}, 2$ 10.24. $-3, 1, \frac{3}{2}$ 11.1. $-2, -1, \frac{-2}{3}, \frac{1}{3}$ 11.2. $-2, \frac{-1}{3}$ 0, $\frac{3}{2}$ 11.3. $\frac{-2}{3}, 0, \frac{1}{2}, 3$ 11.4. $0, \frac{1}{3}, \frac{1}{2}, 1$ 11.5. $\frac{-1}{3}, 0, \frac{3}{2}, 3$ 11.6. $-2, \frac{1}{3}, \frac{1}{2}, 3$ 11.7. $-3, \frac{-3}{2}, \frac{-1}{3}, 1$ 11.8. $\frac{-3}{2}, \frac{-1}{3}, 1, 2$ 11.9. $-2, \frac{2}{3}, 1, \frac{3}{2}$ 11.10. $\frac{-3}{2}, -1, \frac{-2}{3}, 2$ 11.11. $-3, \frac{-1}{3}, \frac{1}{3}, 1$ 11.12. $-2, \frac{1}{3}, \frac{2}{3}, 3$ 11.13. $-3, -2, \frac{-2}{3}, \frac{-1}{3}$ 11.14. $-3, \frac{-3}{2}, \frac{1}{3}, 2$ 11.15. $\frac{-3}{2}, -1, \frac{1}{3}, 2$ 11.16. $\frac{-1}{3}, \frac{1}{2}, 1, 2$ 11.17. $-3, \frac{-3}{2}, \frac{2}{3}, 1$ 11.18. $-3, \frac{-2}{3}, \frac{-1}{2}$ 11.19. $\frac{1}{2}$ 1, $\frac{3}{2}$ 11.20. $-2, \frac{-3}{2}, \frac{-2}{3}, 1$ 11.21. $-1, \frac{-1}{3}, \frac{1}{2}, 1$ 11.22. $-2, \frac{-3}{2}, \frac{-1}{2}, 2$ 11.23. $-2, \frac{-2}{3}, \frac{-1}{3}, 1$ 11.24. $-2, \frac{1}{2}, \frac{3}{2}, 3$ 12.1. $-3, -1$ 12.2. $-3, -1$ 12.3. -2 12.4. $-3, 3$ 12.5. 1, 3 12.6. 1, 3 12.7. -1 12.8. $-3, -2$ 12.9. 3 12.10. $-2, 3$ 12.11. $-2, -1$ 12.12. $-2, 2$ 13.1. $0, \frac{1}{3}, 1$ 13.2. $-3, 0, \frac{1}{2}$ 13.3. $-3, 0, \frac{1}{2}$ 13.4. $-3, \frac{1}{2}, 1$ 13.5. $-3,$ $\frac{-2}{3}, 2$ 13.6. $0, \frac{2}{3}, 3$ 13.7. $1, \frac{3}{2}, 3$ 13.8. $-3, \frac{-1}{3}, 1$ 13.9. $\frac{-3}{2}, 0, 2$ 13.10. $-1, \frac{-2}{3}, 1$ 13.11. $-1, \frac{3}{2}$ 13.12. $\frac{-1}{3}, 0, 2$ 13.13. $\frac{-1}{3}, 1, 2$ 13.14. $0, 1, \frac{3}{2}$ 13.15. $-3, -2, \frac{-1}{2}$ 13.16. $0, \frac{1}{2}, 1$ 13.17. $0, \frac{1}{2}, 1$ 13.18. $-2, \frac{1}{3}, 1$ 13.19. $\frac{-1}{2}, 2, 3$ 13.20. $\frac{-1}{3}, 1$ 13.21. $-2, \frac{-1}{3}, 3$ 13.22. $-3, 0, \frac{3}{2}$ 13.23. $-2, \frac{1}{2}$ 13.24. $-1, \frac{3}{2}$ 14.1. $-3, \frac{-3}{2}, \frac{-1}{2}$ 14.2. $\frac{-1}{3}, \frac{1}{2}, 2$ 14.3. $\frac{-1}{3}, 0, \frac{3}{2}$ 14.4. $\frac{-1}{2}, 0, \frac{2}{3}$ 14.5. $-2, \frac{-2}{3}, \frac{1}{2}$ 14.6. $-3, \frac{-1}{2}, \frac{-1}{3}$ 14.7. $\frac{-2}{3}, \frac{1}{2}, 2$ 14.8. $\frac{-2}{3}, \frac{1}{2}, 3$ 14.9. $\frac{-1}{2}, \frac{-1}{3}, 0$ 14.10. $\frac{-1}{3}, 0, \frac{3}{2}$ 14.11. $-1, \frac{-1}{3}, \frac{3}{2}$ 14.12. $\frac{-1}{2}, \frac{2}{3}, 3$ 14.13. $\frac{-3}{2}, \frac{-1}{3}, 0$ 14.14. $-3, \frac{-2}{3}, \frac{3}{2}$ 14.15. $\frac{-1}{2}, \frac{1}{3}, 2$ 14.16. $0, \frac{1}{3}, \frac{1}{2}$ 14.17. $\frac{-3}{2}, \frac{-1}{3}, 3$ 14.18. $\frac{-3}{2}, \frac{-1}{3}, 0$ 14.19. $0, \frac{2}{3}, \frac{3}{2}$ 14.20. $\frac{-1}{2}, \frac{1}{3}, 2$ 14.21. $\frac{-3}{2}, \frac{-1}{3}, 2$ 14.22. $-3, \frac{-2}{3}, \frac{-1}{2}$ 14.23. $\frac{-1}{2}, 0, \frac{2}{3}$ 14.24. $\frac{-1}{3}, \frac{3}{2}, 3$ 15.1. -1 15.2. 1 15.3. -2 15.4. 0 15.5. 0 15.6. -2 15.7. 0 15.8. 1 15.9. -3 15.10. 0 15.11. -1 15.12. -2 16.1. $\frac{1}{2}, 3$ 16.2. $-2, \frac{-2}{3}$ 16.3. $-1, \frac{-1}{2}$ 16.4. $\frac{-2}{3}, 0$ 16.5. $-2, 2$ 16.6. $-3, 2$ 16.7. $\frac{1}{2}, 3$ 16.8. $-1, 1$ 16.9. 1 16.10. $\frac{-3}{2}, \frac{1}{2}$ 16.11. $\frac{1}{3}, \frac{1}{2}$ 16.12. $\frac{1}{2}, \frac{3}{2}$ 16.13. $-1, \frac{1}{3}$ 16.14. $-1, \frac{1}{2}$ 16.15. $\frac{-1}{3}, 2$ 16.16. $0, \frac{2}{3}$ 16.17. $-1, \frac{2}{3}$ 16.18. $\frac{-1}{2}, 2$ 16.19. s.s.r. 16.20. s.s.r. 16.21. s.s.r. 16.22. s.s.r. 16.23. s.s.r. 16.24. s.s.r. 17.1. $-1, 1, \frac{3}{2}$ 17.2. $-3, -2, \frac{3}{2}, 2$ 17.3. $-2, \frac{-3}{2}, 0, 3$ 17.4. $-3, -2, \frac{1}{2}$ 17.5. $-1, \frac{-1}{2}, 3$ 17.6. $-3, -1, \frac{1}{2}, 2$ 17.7. $-3, -1, \frac{1}{3}, 1$ 17.8. $-2, 0, \frac{3}{2}, 3$ 17.9. $-3, -2, \frac{1}{3}, 2$ 17.10. $-1, \frac{3}{2}, 3$ 17.11. $-2, \frac{-2}{3}, 1, 3$ 17.12. $-2, -1, \frac{-2}{3}, 1$ 17.13. $\frac{-1}{3}, 1, 3$ 17.14. $-1, \frac{-2}{3}, 1, 3$ 17.15. $-2, \frac{1}{3}, 2, 3$ 17.16. $-1, \frac{3}{2}, 3$ 17.17. $\frac{-3}{2}, -1, 1$ 17.18. $-3, \frac{-1}{3}, 0, 1$ 17.19. $-1, \frac{1}{3}, 1, 3$ 17.20. $-1, \frac{-1}{3}, 1$ 17.21. $-2, -1, \frac{1}{2}, 1$ 17.22. $-3, \frac{1}{3}, 1, 3$ 17.23. $-2, \frac{-3}{2}, 0, 3$ 17.24. $-1, \frac{-1}{3}, 2, 3$ 18.1. $-3, \frac{-2}{3}, \frac{-1}{3}, 3$ 18.2. $\frac{-3}{2}, \frac{-1}{2}, 0, 2$ 18.3. $-3, \frac{-2}{3}, \frac{1}{2}, 2$ 18.4. $-1, \frac{-2}{3}, \frac{-1}{2}$ 18.5. $-1, \frac{-1}{2}, \frac{1}{3}, 2$ 18.6. $\frac{-1}{3}, 0, \frac{1}{2}, 2$ 18.7. $\frac{-1}{2}, \frac{-1}{3}, 1$ 18.8. $-3, -1, \frac{-1}{3}, \frac{1}{2}$ 18.9. $-1, \frac{-1}{2}, \frac{-1}{3}$ 18.10. $-3, 0, \frac{1}{2}, \frac{3}{2}$ 18.11. $-2, \frac{2}{3}, 1, 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$\frac{-1}{2}, 0, 2$ 20.13. $\frac{-1}{2}, \frac{3}{2}, 2$ 20.14. $-2, \frac{-3}{2}, \frac{1}{2}$ 20.15. $\frac{-1}{2}, 1, \frac{3}{2}$ 20.16. $\frac{-3}{2}, \frac{-2}{3}, 2$ 20.17. $-1, \frac{-1}{3}, \frac{2}{3}$ 20.18. $\frac{1}{3}, 1$ 20.19. s.s.r. 20.20. 2 20.21. s.s.r. 20.22. -1 20.23. 2 20.24. -1