9.3 Factor Trinomials by Grouping

PRACTICE

Check the work! Multiply out the factored form to see if it matches the polynomial.

1. Is $(3x + 1)(4x - 5)$ the factored form of $12x^2 - 11x - 5$?

$12x^2 - 15x + 4x - 5$

$12x^2 - 11x - 5$ ✓ YES

2. Is $(7h + 4)(h - 7)$ the factored form of $7h^2 - 53h - 28$?

$7h^2 - 49h + 4h - 28$

$7h^2 - 45h - 28$ ✗ NO

3. Is $(2x - 4)(x - 3)$ the factored form of $2x^2 - 7x - 12$?

$2x^2 - 6x - 4x + 12$

$2x^2 - 10x + 12$ ✗ NO

4. Is $(2m + 3)(2m - 3)$ the factored form of $4m^2 - 6$?

$4m^2 - 6m + 6m - 9$

$4m^2 - 9$ ✗ NO

Factor the following if possible. Check your answer by multiplying!

5. $5x^2 - 9x - 2$

$5x^2 - 10x + 1x - 2$

$5x(x - 2) : 1(x - 2)$

$(5x + 1)(x - 2)$

-10, -9, 1, -10

CHECK YOUR ANSWER!

$(5x + 1)(x - 2)$

$5x^2 - 10x + 1x - 2$

$5x^2 - 9x - 2$ ✓

6. $2m^2 - 11m + 12$

$2m^2 - 3m - 8m + 12$

$m(2m - 3) : -4(2m - 3)$

$(m - 4)(2m - 3)$

-11, -3, -8, 24

CHECK YOUR ANSWER!

$(m - 4)(2m - 3)$

$2m^2 - 3m - 8m + 12$

$2m^2 - 11m + 12$ ✓

7. $25p^2 - 81$ Special Case: Difference of Squares!

$(5p - 9)(5p + 9)$

CHECK YOUR ANSWER!

$(5p - 9)(5p + 9)$

$25p^2 + 45p - 45p - 81$

$25p^2 - 81$ ✓

8. $8h^2 - 2h - 3$

$8h^2 - 6h + 4h - 3$

$2h(4h - 3) : 1(4h - 3)$

$(2h + 1)(4h - 3)$

-2, -6, 4, -24

CHECK YOUR ANSWER!

$(2h + 1)(4h - 3)$

$8h^2 - 6h + 4h - 3$

$8h^2 - 2h - 3$ ✓

9. $4x^2 - 8x$ Factor out Greatest Common Factor!

$4x(x - 2)$

CHECK YOUR ANSWER!

$4x(x - 2)$

$4x^2 - 8x$ ✓

10. $6t^2 + 19t + 3$

$6t^2 + 18t + 1t + 3$

$6t(t + 3) : 1(t + 3)$

$(6t + 1)(t + 3)$

19, 18, 1, 18

CHECK YOUR ANSWER!

$(6t + 1)(t + 3)$

$6t^2 + 18t + 1t + 3$

$6t^2 + 19t + 3$ ✓

Solve the following by factoring.

11. $3x^2 + 10x - 8 = 0$

$3x^2 + 12x - 2x - 8 = 0$

$3x(x+4) - 2(x+4) = 0$

$(3x-2)(x+4) = 0$

$3x - 2 = 0$ | $x + 4 = 0$

$+2 \quad +2$ | $-4 \quad -4$

$\frac{3x}{3} = \frac{2}{3}$ | $x = -4$

$x = 2/3$

$x = -4, \frac{2}{3}$

12. $0 = 12x^2 - 16x - 3$

$12x^2 - 18x + 2x - 3 = 0$

$6x(2x-3) + 1(2x-3) = 0$

$(6x+1)(2x-3) = 0$

$6x + 1 = 0$ | $2x - 3 = 0$

$-1 \quad -1$ | $+3 \quad +3$

$\frac{6x}{6} = \frac{-1}{6}$ | $\frac{2x}{2} = \frac{3}{2}$

$x = -\frac{1}{6}$ | $x = 3/2$

$x = -\frac{1}{6}, \frac{3}{2}$

13. $9g^2 - 1 = 0$ Special Case: Difference of Squares!

$(3x+1)(3x-1) = 0$

$3x + 1 = 0$ | $3x - 1 = 0$

$-1 \quad -1$ | $+1 \quad +1$

$\frac{3x}{3} = \frac{-1}{3}$ | $\frac{3x}{3} = \frac{1}{3}$

$x = -\frac{1}{3}$ | $x = \frac{1}{3}$

$x = -\frac{1}{3}, \frac{1}{3}$

14. $7y^2 - 22y = -3$

$+3 \quad +3$

$7y^2 - 22y + 3 = 0$

$7y^2 - 21y - 1y + 3 = 0$

$7y(y-3) - 1(y-3) = 0$

$(7y-1)(y-3) = 0$

$7y - 1 = 0$ | $y - 3 = 0$

$+1 \quad +1$ | $+3 \quad +3$

$\frac{7y}{7} = \frac{1}{7}$ | $y = 3$

$y = \frac{1}{7}$

$y = \frac{1}{7}, 3$

15. $12x^2 = -11x - 2$

$+11x + 2 \quad +11x + 2$

$12x^2 + 11x + 2 = 0$

$12x^2 + 8x + 3x + 2 = 0$

$4x(3x+2) + 1(3x+2) = 0$

$(4x+1)(3x+2) = 0$

$4x + 1 = 0$ | $3x + 2 = 0$

$-1 \quad -1$ | $-2 \quad -2$

$\frac{4x}{4} = \frac{-1}{4}$ | $\frac{3x}{3} = \frac{-2}{3}$

$x = -\frac{1}{4}$ | $x = -\frac{2}{3}$

$x = -\frac{2}{3}, -\frac{1}{4}$

16. $21 = c^2 + 4c$

$-21 \quad -21$

$0 = c^2 + 4c - 21$

$0 = (c+7)(c-3)$

$c + 7 = 0$ | $c - 3 = 0$

$-7 \quad -7$ | $+3 \quad +3$

$c = -7$ | $c = 3$

$c = -7, 3$

18. $2a^2 - 16a = 0$ Factor out Greatest Common Factor!

$2a(a-8)=0$

$2a=0 \quad | \quad a-8=0$

$a=0 \qquad a=8$

$a=0, 8$

19. $2x^2 + 1 = 3x$

$2x^2 - 3x + 1 = 0$

$2x^2 - 2x - 1x + 1 = 0$

$2x(x-1) - 1(x-1) = 0$

$(2x-1)(x-1)=0$

$2x-1=0 \quad | \quad x-1=0$

$2x=1 \qquad x=1$

$x=\frac{1}{2}$

$x=\frac{1}{2}, 1$

Answer the following.

20. Simplify $(4x^2 - 2x + 1) - (x^2 - 3x + 5)$

$4x^2 - 2x + 1 - x^2 + 3x - 5$

$3x^2 + x - 4$

21. Multiply $(2x-3)^2$

$(2x-3)(2x-3)$

$4x^2 - 6x - 6x + 9$

$4x^2 - 12x + 9$

22. Solve $\frac{-2}{x} + 5 = 7$

$-5 \quad -5$

$x \cdot \frac{-2}{x} = 2 \cdot x$

$\frac{-2}{2} = \frac{2x}{2}$

$-1 = x$

23. Write the equation of the linear function.

x	0	3	9	12
$f(x)$	8	12	20	24

$m = \frac{12-8}{3-0} = \frac{4}{3}$

$y = \frac{4}{3}x + 8$

24. Write the equation of the exponential function.

x	0	1	2	3
$f(x)$	120	60	30	15

$\div 2 \quad \div 2 \quad \div 2$

$y = 120\left(\frac{1}{2}\right)^x$

25. If $f(x) = x^2 - x$, find $2f(-2) - 1$

$f(-2) = (-2)^2 - (-2)$

$f(-2) = 4 + 2$

$f(-2) = 6$

$2 \cdot f(-2) - 1$

$2 \cdot 6 - 1$

$12 - 1$

11