

Factoring Polynomials

DIFFERENCE OF SQUARES

Review! Simplify the following:

$$\begin{aligned} \bullet (x+4)(x-4) &= \frac{x^2 - 4x + 4x - 16}{x^2 - 16} \\ \bullet (5x+1)(5x-1) &= \frac{25x^2 - 5x + 5x - 1}{25x^2 - 1} \\ \bullet (2a+3b)(2a-3b) &= \frac{4a^2 - 6ab + 6ab - 9b^2}{4a^2 - 9b^2} \end{aligned}$$

This resulting product is called
a DIFFERENCE OF SQUARES.

To factor a difference of squares, use the following rule:

$$a^2 - b^2 = (a+b)(a-b)$$

Examples: Factor the following difference of squares. Check your answers by FOIL.

1. $a^2 - 4 = a^2 - 2^2$ $= (a+2)(a-2)$	2. $n^2 - 64 = n^2 - 8^2$ $= (n+8)(n-8)$
3. $81 - x^2 = 9^2 - x^2$ $= (9+x)(9-x)$	4. $c^2 - 100$ $(c+10)(c-10)$
5. $k^2 + 25$ $k^2 + 25$	6. $1 - 49y^2$ $(1+7y)(1-7y)$
7. $9b^2 - 100$ $(3b+10)(3b-10)$	8. $25x^2 - 49$ $(5x+7)(5x-7)$
9. $16a^2 - 121$ $(4a+11)(4a-11)$	10. $x^2 - 81y^2$ $(x+9y)(x-9y)$
11. $4h^2 - 25g^2$ $(2h+5g)(2h-5g)$	12. $64u^2 - v^2$ $(8u+v)(8u-v)$
13. $x^2y^2 - 1$ $(xy+1)(xy-1)$	14. $81n^4 - 25$ $(9n^2+5)(9n^2-5)$

15. $4c^2 - 5d^2$ 4c $4c^2 - 5d^2$	16. $49m^4 - 16$ $(7m^2 + 4)(7m^2 - 4)$
17. $k^6 - 16$ $(k^3 + 4)(k^3 - 4)$	18. $4p^4 - 25$ $(2p^2 + 5)(2p^2 - 5)$
19. $121r^6 - 1$ $(11r^3 + 1)(11r^3 - 1)$	20. $64m^4 - 9n^2$ $(8m^2 + 3n)(8m^2 - 3n)$

Multi-Step Factoring:

Look for a GCF first, then factor the difference of squares.

21. $24a^2 - 54b^2$ $6(4a^2 - 9b^2)$ $6(2a + 3b)(2a - 3b)$	22. $36x^3 - 9x$ $9x(4x^2 - 1)$ $9x(2x + 1)(2x - 1)$
23. $45q^3 - 20q$ $5q(9q^2 - 4)$ $5q(3q + 2)(3q - 2)$	24. $32s^2 - 18u^2$ $2(16s^2 - 9u^2)$ $2(4s + 3u)(4s - 3u)$
25. $100b^3 - 36b$ $4b(25b^2 - 9)$ $4b(5b + 3)(5b - 3)$	26. $3x^4 - 48x^2$ $3x^2(x^2 - 16)$ $3x^2(x + 4)(x - 4)$
27. $8x^2y - 32y^3$ $8y(x^2 - 4y^2)$ $8y(x + 2y)(x - 2y)$	28. $125m^3 - 5m$ $5m(25m^2 - 1)$ $5m(5m + 1)(5m - 1)$
29. $3n^2 - 147$ $3(n^2 - 49)$ $3(n + 7)(n - 7)$	30. $18x^2 - 50$ $2(9x^2 - 25)$ $2(3x + 5)(3x - 5)$
31. $m^3n - mn$ $mn(m^2 - 1)$ $mn(m + 1)(m - 1)$	32. $16x^3 - 100x$ $4x(4x^2 - 25)$ $4x(2x + 5)(2x - 5)$
33. $80n^4 - 125n^2$ $5n^2(16n^2 - 25)$ $5n^2(4n + 5)(4n - 5)$	34. $12n^2 - 3$ $3(4n^2 - 1)$ $3(2n + 1)(2n - 1)$