

**Always check for a GCF first!**

DIFFERENCE OF SQUARES $a^2 - b^2$	Perfect Squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144	
	Rule: $a^2 - b^2 = (a+b)(a-b)$	
	1. $4x^4 - 9$ $(2x^2 + 3)(2x^2 - 3)$	2. $10w^5 - 10w$ $10w(w^4 - 1)$ $10w(w^2 + 1)(w^2 - 1)$ $10w(w^2 + 1)(w + 1)(w - 1)$
QUADRATIC TRINOMIALS	3. $6x^2 - 5x - 4$ $ac = -24$ $6x^2 - 8x + 3x - 4$ $-8, 3$ $2x(3x - 4) + 1(3x - 4)$ $(2x + 1)(3x - 4)$	4. $x^2 + x - 42$ $(x + 7)(x - 6)$
QUADRATIC-LIKE TRINOMIALS $ax^4 + bx^2 + c$	5. $x^4 + 2x^2 - 24$ $(x^2 + 6)(x^2 - 4)$ $(x^2 + 6)(x + 2)(x - 2)$	6. $3x^4 + 14x^2 - 5$ $ac = -15$ $3x^4 + 15x^2 - x^2 - 5$ $15, -1$ $3x^2(x^2 + 5) - 1(x^2 + 5)$ $(3x^2 - 1)(x^2 + 5)$
SUM OF CUBES $a^3 + b^3$	Perfect Cubes: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000	
	Rule: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$	
<del>Signs</del> SOAP S O A P	7. $x^3 + 8$ $a = x$ $b = 2$ $(x + 2)(x^2 - 2x + 4)$ S                      O                      AP	8. $64x^3 + 1$ $a = 4x$ $b = 1$ $(4x + 1)(16x^2 - 4x + 1)$ S                      O                      AP

<p>DIFFERENCE OF CUBES</p> <p><math>a^3 - b^3</math></p> <p><u>SOAP</u></p>	<p>Rule: <math>a^3 - b^3 = (a-b)(a^2 + ab + b^2)</math></p> <p>9. <math>x^3 - 27</math></p> <p><math>a = x</math> <math>b = 3</math></p> <p><math>(x-3)(x^2 + 3x + 9)</math></p> <p style="text-align: center;">0                      AP</p>	<p>10. <math>125x^3 - 1</math></p> <p><math>a = 5x</math> <math>b = 1</math></p> <p><math>(5x-1)(25x^2 + 5x + 1)</math></p> <p style="text-align: center;">5                      0                      AP</p>
<p>4 TERMS</p> <p>grouping</p>	<p>11. <math>x^3 - 4x^2 - 9x + 36</math></p> <p><math>x^2(x-4) - 9(x-4)</math></p> <p><math>(x^2-9)(x-4)</math></p> <p><math>(x+3)(x-3)(x-4)</math></p>	<p>12. <math>2x^5 - 18x^4 + 7x - 63</math></p> <p><math>2x^4(x-9) + 7(x-9)</math></p> <p><math>(2x^4+7)(x-9)</math></p>

Solve the following by factoring. Simplify all irrational and complex solutions.

<p>13. <math>(x^2 - 1)(x^2 + 4) = 0</math></p> <p><math>(x+1)(x-1)(x^2+4) = 0</math></p> <p><math>x+1=0</math>   <math>x-1=0</math>   <math>x^2+4=0</math></p> <p><math>x=-1</math>   <math>x=1</math>   <math>x^2 = -4</math></p> <p>                         <math>x = \pm\sqrt{-4}</math></p> <p>                         <math>x = \pm 2i</math></p> <p><math>x = \pm 1, \pm 2i</math></p>	<p>14. <math>x^5 + 4x^3 = 5x^4 - 2x^3</math></p> <p><math>x^5 - 5x^4 + 6x^3 = 0</math></p> <p><math>x^3(x^2 - 5x + 6) = 0</math></p> <p><math>x^3(x-3)(x-2) = 0</math></p> <p><math>x^3=0</math>   <math>x-3=0</math>   <math>x-2=0</math></p> <p><math>x = 0</math> (mult 3), 3, 2</p>
<p>15. <math>x^4 = 16</math></p> <p><math>x^4 - 16 = 0</math></p> <p><math>(x^2 - 4)(x^2 + 4) = 0</math></p> <p><math>(x+2)(x-2)(x^2+4) = 0</math></p> <p><math>x+2=0</math>   <math>x-2=0</math>   <math>x^2+4=0</math></p> <p>                         <math>x^2 = -4</math></p> <p>                         <math>x = \pm 2i</math></p> <p><math>x = -2, 2, \pm 2i</math></p>	<p>16. <math>x^3 = 8x - 2x^2</math></p> <p><math>x^3 + 2x^2 - 8x = 0</math></p> <p><math>x(x^2 + 2x - 8) = 0</math></p> <p><math>x(x+4)(x-2) = 0</math></p> <p><math>x = 0, -4, 2</math></p>

Quad-like trinomial

17.  $x(x^2 + 8) = 8(x + 1)$

$x^3 + 8x = 8x + 8$

$x^3 - 8 = 0$

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

$x - 2 = 0$

$x^2 + 2x + 4 = 0$

$x^2 + 2x = -4$

$x^2 + 2x + 1 = -4 + 1$

$(x + 1)^2 = -3$

$x + 1 = \pm\sqrt{-3}$

$x = 2$

$x = -1 \pm \sqrt{3}i$

Solve by or  
quad form  
compl. sq

18.  $x^4 - 9x^2 + 14 = 0$

$(x^2 - 7)(x^2 - 2) = 0$

$x^2 - 7 = 0$

$x^2 = 2$

$x^2 = 7$

$x = \pm\sqrt{2}$

$x = \pm\sqrt{7}$

$x = \pm\sqrt{7}, \pm\sqrt{2}$

19.  $x^4 + 6x^2 = 27$

$x^4 + 6x^2 - 27 = 0$

$(x^2 + 9)(x^2 - 3) = 0$

$x^2 + 9 = 0$

$x^2 - 3 = 0$

$x^2 = -9$

$x^2 = 3$

$x = \pm\sqrt{-9}$

$x = \pm\sqrt{3}$

$x = \pm 3i$

$x = \pm 3i, \pm\sqrt{3}$

20.  $x^3 + 2x^2 + 9x + 18 = 0$

grouping

$x^2(x + 2) + 9(x + 2) = 0$

$(x^2 + 9)(x + 2) = 0$

$x^2 + 9 = 0$

$x + 2 = 0$

$x^2 = -9$

$x = -2$

$x = \pm\sqrt{-9}$

$x = \pm 3i$

$x = -2, \pm 3i$

21. Find three consecutive integers whose product is 480 more than their sum.

$x, x + 1, x + 2$

$7, 8, 9$

$(x)(x + 1)(x + 2) = x + x + 1 + x + 2 + 480$

$x(x^2 + 3x + 2) = 3x + 483$

$x^3 + 3x^2 + 2x = 3x + 483$

$x^3 + 3x^2 - x - 483 = 0$

Solve using a calculator!

$x = 7$

22. The Perez twins were born two year after their older sister. This year, the product of the three sibling's ages is exactly 4558 more than the sum of their ages. How old are the twins?

twins  $\rightarrow x, x$

sister  $\rightarrow x + 2$

$x(x)(x + 2) = x + x + x + 2 + 4558$

$x^2(x + 2) = 3x + 4560$

$x^3 + 2x^2 - 3x - 4560 = 0$

Solve using a calculator!

$x = 16$  yrs old