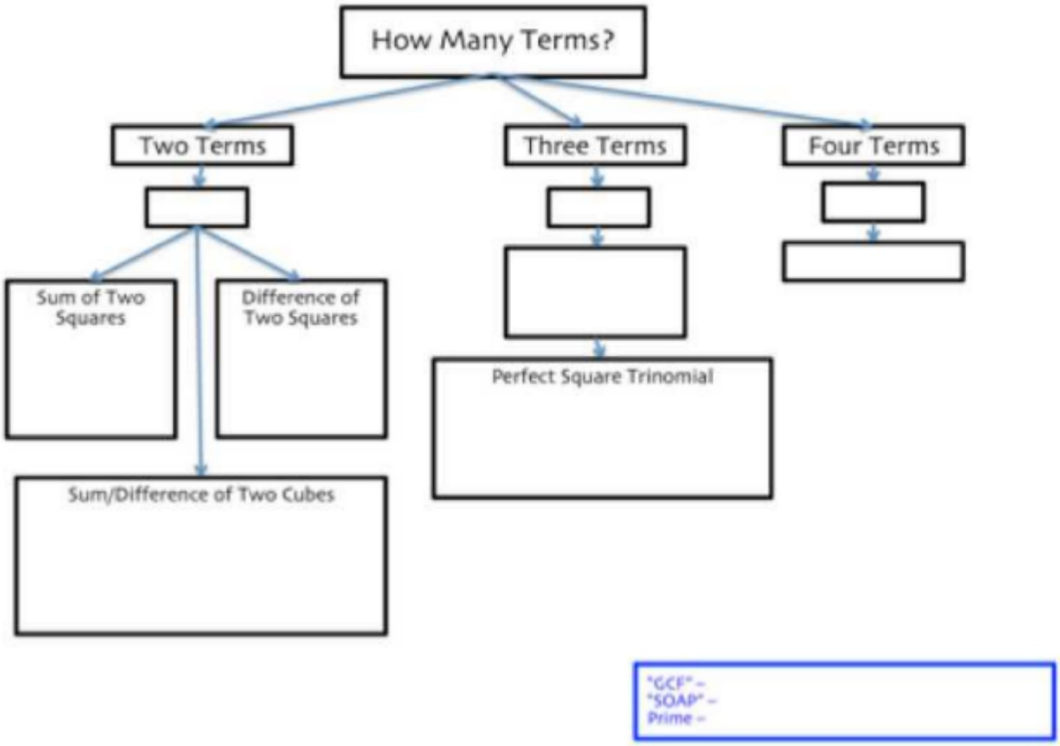
Factoring revisited!



Sum/Difference of cubes

$a = 6x \quad b = y$

$$216x^3 - y^3$$

$$(6x - y)(36x^2 + 6xy + y^2)$$

$$125x^5 + x^8$$

$a^3+b^3=(a+b)(a^2-ab+b^2)$

$x^5(125+x^3)$

$x^5(5+x)(25-5x+x^2)$

or

$x^5(x+5)(x^2-5x+25)$

Difference of squares

$$100x^4 - 4y^8$$

$$4(25x^4 - y^8)$$

$$4(5x^2 + y^4)(5x^2 - y^4)$$

Quadratic Form

$$ax^{2n} + bx^{n} + c$$

$$6x^4 - 18x^2 - 60$$

$u = x^2$

$u^2 = x^4$

$6(x^4 - 3x^2 - 10)$

$6(u^2 - 3u - 10)$

$6(u - 5)(u + 2)$

$6(x^2 - 5)(x^2 + 2)$

$$4x^{2n} + 5x^{n} + 1$$

$u = x^n$

$u^2 = x^{2n}$

$4u^2 + 5u + 1$

$(4u + 1)(u + 1)$

$(4x^n + 1)(x^n + 1)$

$$3^{2n+1} + 11 \cdot 3^n - 4$$

$$3 \cdot 3^{2n} + 11 \cdot 3^n - 4$$

$$3u^2 + 11u - 4$$

$$(3u - 1)(u + 4)$$

$$(3^1 \cdot 3^n - 1)(3^n + 4)$$

or

$$(3^{n+1} - 1)(3^n + 4)$$

$$3^{2n+1} = 3^{2n} \cdot 3^1$$

$$= 3 \cdot 3^{2n}$$

$$u = 3^n$$

$$u^2 = 3^{2n}$$

$$x^5 + x^7$$

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

smaller exponent

$$x^8 + x^6$$

$$x^6(x^2 + 1)$$

Factoring with rational exponents

$$x^{7/3} - x^{4/3} - 2x^{1/3}$$

$$x^{1/3}\left(x^{2} - x^{1} - 2\right) = x^{1/3}\left(x^{2} - x - 2\right)$$

$$x^{1/3}(x-2)(x+1)$$

$\frac{7}{3} - \frac{1}{3} = \frac{6}{3} = 2$ $\quad$ $\frac{4}{3} - \frac{1}{3} = 1$

$$4x^{-2/3} + 8x^{1/3}$$

gcf: $4x^{-2/3}$

$$4x^{-2/3}\left(1 + 2x^{1}\right) = \frac{4(1+2x)}{x^{2/3}}$$

$$x^{1/3} \cdot x^{-2/3}$$

$$x^{3/3}$$

$$x^{1}$$

$$\underbrace{2x(3x-1)^{5/4}} + \underbrace{x^2(3x-1)^{1/4}}$$

$$x(3x-1)^{1/4}\left(2(3x-1)^1 + x\right)$$

$$x(3x-1)^{1/4}(7x-2)$$

$$x^{17} - x^9$$

$$x^9(x^8-1)$$

$$(x^2+4)^{3/2}+(x^2+4)^{7/2}$$

gcf: $(x^2+4)^{3/2}$

$$(x^2+4)^{3/2}\left(1+(x^2+4)^2\right)$$

$$(x^2+4)^{3/2}\left(1+x^4+8x^2+16\right)$$

$$(x^2+4)^{3/2}\left(x^4+8x^2+17\right)$$

$$-8(4x+3)^{-2} + 10(5x+1)(4x+3)^{-1}$$

$-1-(-2)$

1

$x^7 + x^{10}$

$x^7(1+x^3)$

$$-2(4x+3)^{-2}\left(4 - 5(5x+1)(4x+3)^{1}\right)$$

$$\frac{-2\left(4 - 5(20x^2+19x+3)\right)}{(4x+3)^2}$$

$$\frac{-2(4-100x^2-95x-15)}{(4x+3)^2} = \frac{-2(-100x^2-95x-11)}{(4x+3)^2}$$

or

$$\frac{2(100x^2+95x+11)}{(4x+3)^2}$$

$$(2x+1)^{-3/2} - (2x+1)^{-1/2}$$

$$\frac{-1}{2} - \frac{-3}{2} = 1$$

exponent of $(2x+1)$

$$(2x+1)^{-3/2}\left(1 - (2x+1)\right)$$

$$(2x+1)^{-3/2}(-2x)$$

or

$$\frac{-2x}{(2x+1)^{3/2}}$$