

# 多変数最大公約数 (GCD)

$$t1 = a^2x^4 + a^2x^3y^2 + a^2x^2y^2 + 2a^2x^2y + a^2x^2z^2 + a^2xy^4 + 2a^2y^3 + a^2y^2z^2 + b^2x^4 + b^2x^3y^2 + b^2x^2y^2 + 2b^2x^2y + b^2x^2z^2 + b^2xy^4 + 2b^2y^3 + b^2y^2z^2$$

代数代入定義

$$t2 = 4x^6 + 4y^2x^4 + 2x^4 + 2y^2x^2 + yx^2 + 5x^2 + y^3 + 5y^2$$

代数代入定義

$$\text{gcd}(t1, t2) = x^2 + y^2$$

代数計算

$$\begin{aligned} &\text{gcd}(2000376a^5x^2 - 1746360a^5x + 381024a^5 - 5000940a^4bx^3 - 4365900a^4bx^2 + 6670440a^4bx - 1 \\ &663200a^4b + 21829500a^3b^2x^3 - 4765950a^3b^2x^2 - 8318750a^3b^2x + 2722200a^3b^2 - 35728875a^2 \\ &b^3x^3 + 20796875a^2b^3x^2 + 2269500a^2b^3x - 1980000a^2b^3 + 25987500ab^4x^3 - 19852500ab^4x^2 + 24 \\ &75000ab^4x + 540000ab^4 - 7087500b^5x^3 + 6187500b^5x^2 - 1350000b^5x - 7087500b^5x^3 + 618750 \\ &0b^5x^2 - 1350000b^5x) \\ &= 63x^2 - 55x + 12 \end{aligned}$$

$$t1 = x_1^5 + y_1x_1^4 + 5y_1^2x_1^3 + z_1x_1^3 + 2y_1^2x_1^2 + z_1^2x_1^2 + 2y_1^3x_1 + y_1z_1^2x_1 + 10y_1^4 + 5y_1^2z_1^2 + 2y_1^2z_1 + z_1^3$$

$$t2 = 2x_1^5 + y_1x_1^4 + 5y_1^2x_1^3 + 4z_1x_1^3 + 4y_1^2x_1^2 + 2z_1^2x_1^2 + 2y_1^3x_1 + y_1z_1^2x_1 + 10y_1^4 + 5y_1^2z_1^2 + 8y_1^2z_1 + 4z_1^3$$

$$\text{gcd}(t1, t2) = x_1^3 + 2y_1^2 + z_1^2$$

$$\begin{aligned} \text{lcm}(t1, t2) &= 2x_1^7 + 3x_1^6y_1 + 16x_1^5y_1^2 + 6x_1^5z_1 + 10x_1^4y_1^3 + 4x_1^4y_1^2 + 5x_1^4y_1z_1 + 2x_1^4z_1^2 + 25x_1^3y_1^4 + 6x_1^3y_1^3 + 25x_1^3y_1^2z_1 \\ &+ 3x_1^3y_1z_1^2 + 4x_1^3z_1^2 + 32x_1^2y_1^4 + 16x_1^2y_1^2z_1^2 + 12x_1^2y_1^2z_1 + 6x_1^2z_1^3 + 20x_1y_1^5 + 10x_1y_1^3z_1^2 + 10x_1y_1^3z_1 + 5x_1y_1z_1^3 + 50y_1^6 \\ &+ 25y_1^4z_1^2 + 50y_1^4z_1 + 25y_1^2z_1^3 + 8y_1^2z_1^2 + 4z_1^4 \end{aligned}$$

大きな数式

$$\begin{aligned} T1 &= x^9y^2z^2 + 3x^8y^4z^2 + 3x^8y^3z + x^8y^2z^4 + x^8y^2z^2 + 2x^8yz^5 + 2x^8y + 9x^7y^5z + 3x^7y^4z^2 + x^7y^3z^4 + 3x^7y^3z^3 + 8x^7 \\ &y^3z^2 + 6x^7y^3 + 7x^7y^2z^4 + 2x^7yz^5 + 2x^7yz^4 + 2x^7yz^3 + 2x^7yz^2 + 4x^7z^3 + 15x^6y^5z^2 + 3x^6y^4z^3 + 9x^6y^4z + 6x^6y^3z^4 + \\ &6x^6y^3z^3 + 3x^6y^3z^2 + 3x^6y^3 + 10x^6y^2z^5 + x^6y^2z^4 + 6x^6y^2z^3 + 5x^6y^2z^2 + x^6y^2z + 6x^6y^2 + 4x^6yz^5 + 2x^6yz^4 + 2x^6y \\ &z^3 + 4x^6z^6 + 4x^6z^2 + 9x^5y^5 + 5x^5y^4z^4 + 15x^5y^4z^2 + 3x^5y^4z + 9x^5y^3z^3 + 4x^5y^3z^2 + 9x^5y^3z + 2x^5y^2z^5 + 17x^5y^2z^4 + 1 \\ &3x^5y^2z^3 + 7x^5y^2z^2 + 4x^5yz^5 + 2x^5yz^4 + 11x^5yz^2 + 12x^5y + 4x^5z^6 + 4x^5z^5 + 4x^5z^3 + 6x^4y^4z^2 + 3x^4y^4z + 13x^4y^4 + \\ &5x^4y^3z^4 + x^4y^3z^3 + 22x^4y^3z^2 + 12x^4y^3z + 18x^4y^3 + 12x^4y^2z^5 + x^4y^2z^4 + 6x^4y^2z^3 + 9x^4y^2z^2 + 21x^4y^2z + 2x^4y^2 + \\ &4x^4yz^5 + 2x^4yz^4 + 13x^4yz^3 + 13x^4yz^2 + 6x^4y + 4x^4z^6 + 8x^4z^5 + 12x^4z^3 + 14x^4 + 12x^3y^6 + 9x^3y^4z^2 + x^3y^3z^4 + 23 \\ &x^3y^3z^3 + 21x^3y^3z^2 + 9x^3y^3 + 2x^3y^2z^4 + 9x^3y^2z^3 + 47x^3y^2z^2 + 3x^3y^2z + 18x^3y^2 + 7x^3yz^5 + 4x^3yz^4 + 12x^3yz^3 + 1 \\ &4x^3z^6 + 4x^3z^4 + 14x^3z^3 + 12x^3z^2 + 4x^2y^5z^2 + 12x^2y^5 + 3x^2y^4 + 8x^2y^3z^2 + x^2y^3z + 9x^2y^3 + 5x^2y^2z^5 + x^2y^2z^4 + 17 \\ &x^2y^2z^3 + 3x^2y^2z^2 + 3x^2y^2z + 21x^2y^2 + 2x^2yz^5 + 2x^2yz^4 + 6x^2yz^3 + 12x^2yz^2 + 7x^2yz + 18x^2y + 14x^2z^5 + 26x^2z^3 + \\ &4xy^4z^2 + 12xy^4 + 8xy^3z^3 + xy^3z^2 + 5xy^2z^2 + 6xy^2 + 5xyz^5 + 15xyz^3 + 13xyz^2 + 18xy + 10xz^6 + 14xz^2 + 42x + 4 \\ &y^5 + 12y^4 + 28y^3 + 5y^2z^3 + 15yz^3 + 35z^3 \end{aligned}$$

$$T2=y^2z^2x^9+yx^8(3y^3z^2+3y^2z+yz^4+yz^2+2z^5+2)+9y^5zx^7+3y^4z^2x^7+6y^3x^7+y^3z^4x^7+3y^3z^3x^7+8y^3z^2x^7+7y^2z^4x^7+2yz^5x^7+2yz^4x^7+2yz^3x^7+2yz^2x^7+4z^3x^7+15y^5z^2x^6+3y^4z^3x^6+9y^4zx^6+3y^3x^6+6y^3z^4x^6+6y^3z^3x^6+3y^3z^2x^6+6y^2x^6+10y^2z^5x^6+y^2z^4x^6+6y^2z^3x^6+5y^2z^2x^6+y^2zx^6+4yz^5x^6+2yz^4x^6+2yz^3x^6+4z^6x^6+4z^2x^6+9y^5x^5+5y^4z^4x^5+15y^4z^2x^5+3y^4zx^5+9y^3z^3x^5+4y^3z^2x^5+9y^3zx^5+2y^2z^5x^5+17y^2z^4x^5+13y^2z^3x^5+7y^2z^2x^5+9yx^5+4yz^5x^5+2yz^4x^5+11yz^2x^5+4z^6x^5+4z^5x^5+4z^3x^5+13y^4x^4+6y^4z^2x^4+3y^4zx^4+9y^3x^4+5y^3z^4x^4+y^3z^3x^4+22y^3z^2x^4+12y^3zx^4+2y^2x^4+12y^2z^5x^4+y^2z^4x^4+6y^2z^3x^4+9y^2z^2x^4+21y^2zx^4+6yx^4+4yz^5x^4+2yz^4x^4+13yz^3x^4+10yz^2x^4+4z^6x^4+8z^5x^4+6z^3x^4+14x^4+12y^6x^3+9y^4z^2x^3+9y^3x^3+y^3z^4x^3+23y^3z^3x^3+21y^3z^2x^3+9y^2x^3+2y^2z^4x^3+9y^2z^3x^3+44y^2z^2x^3+3y^2zx^3+7yz^5x^3+4yz^4x^3+12yz^3x^3+14z^6x^3+4z^4x^3+14z^3x^3+6z^2x^3+12y^5x^2+4y^5z^2x^2+3y^4x^2+9y^3x^2+8y^3z^2x^2+y^3zx^2+21y^2x^2+5y^2z^5x^2+y^2z^4x^2+17y^2z^3x^2+3y^2z^2x^2+3y^2zx^2+9yx^2+2yz^5x^2+2yz^4x^2+6yz^3x^2+9yz^2x^2+7yzx^2+14z^5x^2+20z^3x^2+12y^4x+4y^4z^2x+8y^3z^3x+y^3z^2x+3y^2x+5y^2z^2x+9yx+5yz^5x+15yz^3x+13yz^2x+10z^6x+14z^2x+21x+4y^5+12y^4+28y^3+5y^2z^3+15yz^3+35z^3$$

$$\gcd(T1,T2)=x^4y+3x^3y^3+x^3yz^2+2x^3z^3+x^2y^2z^2+3x^2y^2+2x^2z^2+xyz^2+3xy+2xz^3+y^2+3y+7$$

3つ以上の数式のGCD

$$T1=x^3+y^3+z^3-3xyz$$

$$T2=x^3+3x^2y+3x^2z+3xy^2+6xyz+3xz^2+y^3+3y^2z+3yz^2+z^3$$

$$T3=2x^3+7x^2y-x^2z+8xy^2-8xz^2+3y^3+y^2z-7yz^2-5z^3$$

$$\gcd(T1,T2,T3)=x+y+z$$

## < 多変数因数分解の例 >

3変数10次式

$$10x^6y^3+8x^6y^2z^2+15x^6yz+12x^6z^3+15x^5yz+12x^5z^3+4x^4y^5+6x^4y^3z+5x^4y^2z+4x^4yz^3+6x^3y^3z+4x^3y^2+15x^3y+12x^3z^2+6x^3z+2x^2y^4z+6x^2z+6xy^3+2xyz+6=(2x^3y^2+3x^3z+3x^2z+xyz+3)(5x^3y+4x^3z^2+2xy^3+2)$$

4変数12次式

$$6w^7+2w^6xyz+4w^4x^3y^2+6w^4x^3z^3+6w^4x^2z+15w^3x^3y+12w^3x^3z^3+6w^3xy^4+5w^2x^4y^2z+4w^2x^4yz^4+2w^2x^2y^5z+10x^6y^3+8x^6y^2z^3+15x^6yz^3+12x^6z^6+15x^5yz+12x^5z^4+4x^4y^6+6x^4y^4z^3+6x^3y^4z=(2w^4+5x^3y+4x^3z^3+2xy^4)(3w^3+w^2xyz+2x^3y^2+3x^3z^3+3x^2z)$$

文字修飾変数でも可能

$$x_1^6+3z_1x_1^5+2y_1^3x_1^4+y_1z_1x_1^4+6y_1^3z_1x_1^3+2y_1^2x_1^3+y_1z_1x_1^3+2z_1^3x_1^3+2y_1^4z_1x_1^2+3y_1z_1^2x_1^2+3z_1^4x_1^2+4y_1^5x_1+2y_1^3z_1^3x_1+y_1^2z_1^2x_1+y_1z_1^4x_1+2y_1^3z_1+2y_1^2z_1^3+y_1z_1^4+z_1^6=(x_1^3+2x_1y_1^3+y_1z_1+z_1^3)(x_1^3+3x_1^2z_1+x_1y_1z_1+2y_1^2+z_1^3)$$

### 3変数14次式

$$\begin{aligned}
 & x^9y^2z^2+3x^8y^4z^2+3x^8y^3z+x^8y^2z^4+x^8y^2z^2+2x^8y^5+2x^8y+9x^7y^5z+3x^7y^4z^2+x^7y^3z^4+3x^7y^3z^3+8x^7y^3z^2+6 \\
 & x^7y^3+7x^7y^2z^4+2x^7yz^5+2x^7yz^4+2x^7yz^3+2x^7yz^2+4x^7z^3+15x^6y^5z^2+3x^6y^4z^3+9x^6y^4z+6x^6y^3z^4+6x^6y^3 \\
 & z^3+3x^6y^3z^2+3x^6y^3+10x^6y^2z^5+x^6y^2z^4+6x^6y^2z^3+5x^6y^2z^2+x^6y^2z+6x^6y^2+4x^6y^5+2x^6yz^4+2x^6yz^3+4x^6 \\
 & z^6+4x^6z^2+9x^5y^5+5x^5y^4z^4+15x^5y^4z^2+3x^5y^4z+9x^5y^3z^3+4x^5y^3z^2+9x^5y^3z+2x^5y^2z^5+17x^5y^2z^4+13x^5y^2 \\
 & z^3+7x^5y^2z^2+4x^5yz^5+2x^5yz^4+11x^5yz^2+9x^5y+4x^5z^6+4x^5z^5+4x^5z^3+6x^4y^4z^2+3x^4y^4z+13x^4y^4+5x^4y^3 \\
 & z^4+x^4y^3z^3+22x^4y^3z^2+12x^4y^3z+9x^4y^3+12x^4y^2z^5+x^4y^2z^4+6x^4y^2z^3+9x^4y^2z^2+21x^4y^2z+2x^4y^2+4x^4yz^5 \\
 & +2x^4yz^4+13x^4yz^3+10x^4yz^2+6x^4y+4x^4z^6+8x^4z^5+6x^4z^3+14x^4+12x^3y^6+9x^3y^4z^2+x^3y^3z^4+23x^3y^3z^3+ \\
 & 21x^3y^3z^2+9x^3y^3+2x^3y^2z^4+9x^3y^2z^3+44x^3y^2z^2+3x^3y^2z+9x^3y^2+7x^3yz^5+4x^3yz^4+12x^3yz^3+14x^3z^6+4 \\
 & x^3z^4+14x^3z^3+6x^3z^2+4x^2y^5z^2+12x^2y^5+3x^2y^4+8x^2y^3z^2+x^2y^3z+9x^2y^3+5x^2y^2z^5+x^2y^2z^4+17x^2y^2z^3+3 \\
 & x^2y^2z^2+3x^2y^2z+21x^2y^2+2x^2yz^5+2x^2yz^4+6x^2yz^3+9x^2yz^2+7x^2yz+9x^2y+14x^2z^5+20x^2z^3+4xy^4z^2+12 \\
 & xy^4+8xy^3z^3+xy^3z^2+5xy^2z^2+3xy^2+5xyz^5+15xyz^3+13xyz^2+9xy+10xz^6+14xz^2+21x+4y^5+12y^4+28 \\
 & y^3+5y^2z^3+15yz^3+35z^3 \\
 & =(x^4y+3x^3y^3+x^3yz^2+2x^3z^3+x^2y^2z^2+3x^2y^2+2x^2z^2+xyz^2+3xy+2xz^3+y^2+3y+7)(x^5yz^2+3x^4y^2z+x^4yz^2 \\
 & +2x^4+5x^3y^2z^2+2x^3z^3+3x^2y^2+x^2yz+2x^2z^3+xyz^2+2xz^2+3x+4y^3+5z^3)
 \end{aligned}$$

### 5変数6次式

$$\begin{aligned}
 & x^6+4ux^4+4yzx^4+2u^3x^3+3u^2x^3+2w^3x^3+3wyzx^3+2y^3x^3+2z^3x^3+4u^4x+12u^3x+4u^3yzx+12u^2yzx+4u \\
 & w^3x+12uwyzx+4uy^3x+4uz^3x+4w^3yzx+12wy^2z^2x+4y^4zx+4yz^4x+u^6+3u^5+2u^3w^3+3u^3wyz+2u^3y^3+ \\
 & 2u^3z^3+3u^2w^3+3u^2y^3+3u^2z^3+w^6+3w^4yz+2w^3y^3+2w^3z^3+3wy^4z+3wyz^4+y^6+2y^3z^3+z^6 \\
 & =(x^3+u^3+3u^2+w^3+3wyz+y^3+z^3)(x^3+4ux+4yzx+u^3+w^3+y^3+z^3)
 \end{aligned}$$

### 5変数9次式

$$\begin{aligned}
 & 3v^5+6v^4x^2+v^3w^3+3v^3wyz+4v^3x^3y^2+v^3y^3+2v^3y^2z^2+v^3z^3+2v^2w^3x^2+3v^2w^3+15v^2w^2yz+6v^2wx^2yz+8 \\
 & v^2x^5y^2+3v^2x^3+2v^2x^2y^3+4v^2x^2y^2z^2+2v^2x^2z^3+12v^2xyz+3v^2y^3+3v^2z^3+w^6+5w^5yz+3w^4yz+4w^3x^3y^2+ \\
 & w^3x^3+4w^3xyz+2w^3y^3+17w^3y^2z^2+2w^3z^3+20w^2x^3y^3z+5w^2y^4z+10w^2y^3z^3+5w^2yz^4+3wx^3yz+12wx \\
 & y^2z^2+3wy^4z+3wyz^4+4x^6y^2+16x^4y^3z+4x^3y^5+x^3y^3+4x^3y^2z^3+2x^3y^2z^2+x^3z^3+4xy^4z+8xy^3z^3+4xyz^4+ \\
 & y^6+2y^5z^2+2y^3z^3+2y^2z^5+z^6 \\
 & =(v^3+2v^2x^2+w^3+5w^2yz+x^3+4xyz+y^3+z^3)(3v^2+w^3+3wyz+4x^3y^2+y^3+2y^2z^2+z^3)
 \end{aligned}$$

### 3分割例

$$\begin{aligned}
 & 2x^7+2y^3x^5+y^2x^5+4yz^2x^5+10yzx^5+2z^3x^5+z^2x^5+2y^3x^4+2z^3x^4+y^5x^3+10y^4zx^3+3y^3z^2x^3+4y^3zx^3+21 \\
 & y^2z^3x^3+8y^2z^2x^3+12yz^4x^3+4yz^3x^3+z^5x^3+2y^6x^2+y^5x^2+4y^4z^2x^2+2y^4zx^2+4y^3z^3x^2+y^3z^2x^2+y^2z^3x^2+4y \\
 & z^5x^2+2yz^4x^2+2z^6x^2+z^5x^2+4y^6zx+8y^5z^2x+12y^4z^3x+20y^3z^4x+16y^2z^5x+4yz^6x+y^8+2y^7z+3y^6z^2+6y^5 \\
 & z^3+6y^4z^4+4y^3z^5+5y^2z^6+4yz^7+z^8 \\
 & =(x^3+4yzx+y^3+z^3)(2x^2+y^2+2yz+z^2)(x^2+y^3+2yz+z^3)
 \end{aligned}$$

## 平方例

$$x^6+8yzx^4+2w^3x^3+2y^3x^3+2z^3x^3+16y^2z^2x^2+8w^3yzx+8y^4zx+8yz^4x+w^6+2w^3y^3+2w^3z^3+y^6+2y^3z^3+z^6 \\ = (x^3+4yzx+w^3+y^3+z^3)^2$$

$$x^9-9yzx^7+3y^3x^6+3z^3x^6+27y^2z^2x^5-18y^4zx^4-18yz^4x^4+3y^6x^3-21y^3z^3x^3+3z^6x^3+27y^5z^2x^2+27y^2z^5x^2-9 \\ y^7zx-18y^4z^4x-9yz^7x+y^9+3y^6z^3+3y^3z^6+z^9 \\ = (x+y+z)^3(x^2-yx-zx+y^2-yz+z^2)^3$$

## 6変数11次式

$$2u^3vx^6+4y^2x^6+4u^3v^3x^5+8v^2y^2x^5+8u^4vx^4+8u^3vyzx^4+16uy^2x^4+16y^3zx^4+2u^6vx^3+2u^3v^4x^3+2u^3vw^3x^3+10 \\ u^3vw^2yzx^3+2u^3vy^3x^3+2u^3vz^3x^3+4u^3y^2x^3+3u^2x^3+4v^3y^2x^3+3v^2x^3+w^3x^3+4w^3y^2x^3+20w^2y^3zx^3+3wyzx^3+4 \\ y^5x^3+y^3x^3+4y^2z^3x^3+2y^2z^2x^3+z^3x^3+6u^2v^2x^2+6v^4x^2+2v^2w^3x^2+6v^2wyzx^2+2v^2y^3x^2+4v^2y^2z^2x^2+2v^2z^3x^2+1 \\ 2u^3x+12u^2yzx+12uv^2x+4uw^3x+12uwyzx+4uy^3x+8uy^2z^2x+4uz^3x+12v^2yzx+4w^3yzx+12wy^2z^2x+4y^4zx \\ +8y^3z^3x+4y^4x+3u^5+3u^3v^2+u^3w^3+3u^3wyz+u^3y^3+2u^3y^2z^2+u^3z^3+3u^2v^3+3u^2w^3+15u^2w^2yz+3u^2y^3+3u^2 \\ z^3+3v^5+v^3w^3+3v^3wyz+v^3y^3+2v^3y^2z^2+v^3z^3+3v^2w^3+15v^2w^2yz+3v^2y^3+3v^2z^3+w^6+5w^5yz+3w^4yz+2w^3 \\ y^3+17w^3y^2z^2+2w^3z^3+5w^2y^4z+10w^2y^3z^3+5w^2y^4z+3wy^4z+3wyz^4+y^6+2y^5z^2+2y^3z^3+2y^2z^5+z^6 \\ = (u^3+4ux+v^3+2v^2x^2+w^3+5w^2yz+x^3+4xyz+y^3+z^3)(2u^3vx^3+3u^2+3v^2+w^3+3wyz+4x^3y^2+y^3+2y^2z^2+z^3)$$

$$t^6+5t^5u^2+2t^5w+10t^4u^2w+t^4v^3+3t^4v^2+2t^3u^3vx^3+3t^3u^3+5t^3u^2v^3+3t^3u^2+4t^3ux+6t^3v^2w+2t^3v^2x^2+2t^3w^3+5 \\ t^3w^2yz+3t^3wyz+4t^3x^3y^2+t^3x^3+4t^3xyz+2t^3y^3+2t^3y^2z^2+2t^3z^3+15t^2u^5+4t^2u^3vwx^3+20t^2u^3x+10t^2u^2v^2x^2+5 \\ t^2u^2w^3+25t^2u^2w^2yz+6t^2u^2w+5t^2u^2x^3+20t^2u^2xyz+5t^2u^2y^3+5t^2u^2z^3+3t^2v^5+2t^2w^4+6t^2w^2yz+8t^2wx^3y^2+2 \\ t^2wy^3+4t^2wy^2z^2+2t^2wz^3+2tu^3v^4x^3+9tu^3v^2+3tu^2v^3+12tuv^2x+6tv^4x^2+tv^3w^3+3tv^3wyz+4tv^3x^3y^2+tv^3y^3+2t \\ v^3y^2z^2+tv^3z^3+3tv^2w^3+15tv^2w^2yz+3tv^2x^3+12tv^2xyz+3tv^2y^3+3tv^2z^3+6u^6vx^3+9u^5+8u^4vx^4+4u^3v^3x^5+2u^3v \\ w^3x^3+10u^3vw^2x^3yz+2u^3vx^6+8u^3vx^4yz+2u^3vx^3y^3+2u^3vx^3z^3+3u^3w^3+9u^3wyz+12u^3x^3y^2+12u^3x+3u^3y^3+ \\ 6u^3y^2z^2+3u^3z^3+6u^2v^2x^2+3u^2w^3+15u^2w^2yz+3u^2x^3+12u^2xyz+3u^2y^3+3u^2z^3+4uw^3x+12uwxyz+16ux^4 \\ y^2+4uxy^3+8uxy^2z^2+4uxz^3+2v^2w^3x^2+6v^2wx^2yz+8v^2x^5y^2+2v^2x^2y^3+4v^2x^2y^2z^2+2v^2x^2z^3+w^6+5w^5yz+3w^4y \\ z+4w^3x^3y^2+w^3x^3+4w^3xyz+2w^3y^3+17w^3y^2z^2+2w^3z^3+20w^2x^3y^3z+5w^2y^4z+10w^2y^3z^3+5w^2yz^4+ \\ 3wx^3yz+12wxy^2z^2+3wy^4z+3wyz^4+4x^6y^2+16x^4y^3z+4x^3y^5+x^3y^3+4x^3y^2z^3+2x^3y^2z^2+x^3z^3+4xy^4z+8xy^3z^3 \\ +4xyz^4+y^6+2y^5z^2+2y^3z^3+2y^2z^5+z^6 \\ = (t^3+2t^2w+tv^3+3u^3+4ux+2v^2x^2+w^3+5w^2yz+x^3+4xyz+y^3+z^3)(t^3+5t^2u^2+3tv^2+2u^3vx^3+3u^2+w^3+3wyz+ \\ 4x^3y^2+y^3+2y^2z^2+z^3)$$