

BellWork

Simplify:

$$\frac{-\cancel{6}^0}{3m^2} = \frac{-1}{3m^2}$$

$$\frac{x^{\textcircled{10}}}{x^{-2}} = x^{10+2} = x^{12}$$

$$\left(\frac{x^{12}}{y^4}\right)^{\frac{3}{4}} = \frac{x^9}{y^3}$$

$\frac{3}{4} \cdot \frac{4}{1} = 3$
 $\frac{3}{4} \cdot \frac{4}{1} = 3$

$$(-3)^3(-3)^4$$
$$(-3)^7 = -2187$$

Polynomial function

$$f(x) = \textcircled{a_n}x^{\textcircled{n}} + a_{n-1}x^{n-1} + \dots + a_1x + a_0$$

leading coefficient: a_n

degree: n

constant term: a_0

$$f(x) = \textcircled{3}x^{\textcircled{5}} - 7x^{\textcircled{4}} + 3x^{\textcircled{3}} - 8x^{\textcircled{2}} + x^{\textcircled{1}} - 20$$
$$f(x) = \textcircled{-27}x^{\textcircled{10}} + 9$$

Degree	Type	Example
0	Constant	$f(x) = 5x^0$ $f(x) = 5$ $y = -20$
1	Linear	$f(x) = 3x + 5$ $y = x$
2	Quadratic	$f(x) = 7x^2 - 3x + 1$ $y = 5x^2 - 3$
3	Cubic	$f(x) = x^3$
4	Quartic	$f(x) = 7x^4 - 10x^2 + 1$ $y = x^4$
5	Quintic	$y = x^5$

What if the expression has more than 1 variable, how do you find the degree?

$$x^2 + 3x + 1 \quad \text{polynomial} \quad \text{degree 2}$$

$$\underbrace{x^2 y^1}_{\substack{\text{degree} \\ 3 \\ \text{term}}} + 3 \underbrace{x^1 y^4}_{\substack{\text{degree} \\ 5 \\ \text{term}}} \quad \text{Not polynomial} \quad \text{degree 5}$$

Polynomials can also be classified by the number of terms as well as its degree.

monomial

1 term

5

m^3

$5m^3$

binomial

2 terms

$m + 7$

$m^{20} + m^{10}$

$5x + 7$

trinomial

3 terms

$x^2 - 3x - 9$

$x^7 - 10x^4 + 3$

Polynomial Function 😊 (WHOLE # Exponents for the variables)

(in standard form the powers are decreasing)

Leading Coefficient is # in the front of the polynomial if it is in standard form.

Remember for the variables only

No Negative Exponents on the variables

No Variable Exponents

No Fractional Exponents on the variables

Identify whether the following are polynomials.

If it is a polynomial state the degree, type, leading coefficient, and constant.

1. $g(x) = 1x^4 - \frac{1}{4}x^2 + 3$
polynomial
Lc: 1
constant: 3
quartic

2. $k(x) = 7x - \sqrt{3} + \pi x^2$
polynomial
L.C.: π
constant: $-\sqrt{3}$
 $k(x) = \pi x^2 + 7x - \sqrt{3}$
quadratic

3. $f(x) = 5x^2 + 3x^{-1} - x$
Not polynomial

4. $h(x) = x + 2^x - .6x^5$
Not polynomial

Add or subtract the following polynomials.

1. $(2y^2 - 5y + 1) + (y^2 - y - 4)$
 $3y^2 - 6y - 3$

2. $(5x^4 - 2x^3 + 9) + (-2x^4 + 8x^2 + x + 2)$
 $7x^4 - 2x^3 - 8x^2 + x + 7$

Find the sum, the difference or fill in the \square with the missing information.

$$3. \quad (\cancel{4x^5} + \cancel{3x^4} - \cancel{5x} + \cancel{1}) + (\cancel{-x^3} + \cancel{-2x^4} + \cancel{x^5} + \cancel{-1})$$

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

$$4. \quad (\cancel{2y^2} + \square \cancel{-6}y + 1) + (\cancel{y^2} - 4) = \square \cancel{3}y^2 - 6y - 3$$

Find the product

$$4. \quad 2x^3(5x-1)$$

$$10x^4 - 2x^3$$

$$5. \quad (2x - 4)(3x + 1)$$

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

$$6x^2 - 10x - 4$$



6. $\blacksquare - 1)(y^2 + 6y - 3)$

$$\begin{array}{r}
 y^3 + 6y^2 - 3y \\
 - y^2 - 6y + 3 \\
 \hline
 y^3 + 5y^2 - 9y + 3
 \end{array}$$

7. $(\blacksquare + \blacksquare + 1)(x^2 - 8x + 3)$

$$\begin{array}{r}
 -x^4 + 8x^3 - 3x^2 \\
 4x^3 - 32x^2 + 12x \\
 x^2 - 8x + 3 \\
 \hline
 -x^4 + 12x^3 - 34x^2 + 4x + 3
 \end{array}$$

$$8. (x+4)(x-6)(x-5)$$

$$(x+4)(x^2-5x-6x+30)$$

$$(x+4)(x^2-11x+30)$$

$$x^3-11x^2+30x$$

$$4x^2-44x+120$$

$$x^3-7x^2-14x+120$$

$$(2 \cdot 3) 4$$

$$6 \cdot 4 = 24$$

$$2 \cdot (3 \cdot 4)$$

$$2 \cdot 12 = 24$$

$$9. (2c+5)^2$$

$$(2c+5)(2c+5)$$

$$4c^2+10c+10c+25$$

$$4c^2+20c+25$$

$$10. (5p-3)(5p+3)$$

$$25p^2+15p-15p-9$$

$$25p^2-9$$

$$11. (2x + 1)^3$$

$$(2x+1)(2x+1)(2x+1)$$

$$(2x+1)(4x^2+2x+2x+1)$$

$$(2x+1)(4x^2+4x+1)$$

$$8x^3 + 8x^2 + 2x$$

$$4x^2 + 4x + 1$$

$$\hline 8x^3 + 12x^2 + 8x + 1$$

Find two polynomials with a sum and product that have the following degrees. If you cannot find the polynomials, explain why.

a) sum degree 4 and product is degree 4

$$X^{\boxed{4}} + X^{\boxed{0}} = X^4$$

$$X^{\boxed{4}} \cdot X^{\boxed{0}} = X^4$$

$$X^4 \text{ \& \& } X^0$$

b) sum degree 3 and product is degree 5

Diagram illustrating polynomial addition and multiplication with degree annotations:

- Top row: $X^3 + X^2 = X^3$. The X^3 term is annotated with a blue box containing '3'. The X^2 term is annotated with a blue box containing '2'. A red arrow points from the X^2 term to the X^3 term, indicating that the degree of the sum is determined by the highest degree term.
- Bottom row: $X^3 \cdot X^2 = X^5$. The X^3 term is annotated with a blue box containing '3'. The X^2 term is annotated with a blue box containing '2'. A red arrow points from the X^2 term to the X^5 term, indicating that the degree of the product is the sum of the degrees of the factors.

To the right, the expression $X^3 \cdot X^2$ is written in green, with a small '1' above the X^2 term, possibly indicating a coefficient or a specific term.

c) sum degree 2 and product degree 1

Diagram illustrating polynomial addition and multiplication with degree annotations:

- Top row: $X^2 + X^{-1} = X^2$. The X^2 term is annotated with a blue box containing '2'. The X^{-1} term is annotated with a blue box containing '-1'. A green arrow points from the X^{-1} term to the X^2 term, indicating that the degree of the sum is determined by the highest degree term.
- Bottom row: $X^2 \cdot X^{-1} = X^1$. The X^2 term is annotated with a blue box containing '2'. The X^{-1} term is annotated with a blue box containing '-1'. A green arrow points from the X^{-1} term to the X^1 term, indicating that the degree of the product is the sum of the degrees of the factors.

Not possible