HIGHER ALGEBRA

DIVIDING & FACTORISING POLYNOMIAL EXPRESSIONS

A polynomial is an algebraic expression involving many terms & can be factorized using long division.

For an expression to be a polynomial, every index must be a positive whole number, and there cannot be any roots of a variable, and there cannot be any variable in the denominator of a fraction (this would be a negative index)

- not a polynomial, is the same as , which is not a whole number

- not a polynomial, is the same as , which is not a positive index

Long division with polynomials

The divisor has 2 terms; x & 2

The dividend has 4 terms; 5x^3, 6x^2, 28x & 2

1. How many x in 5x^3? 5x^2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5x^2 |  |  |  |  |  |  |
| X + 2 | 5x^3 | - | 6x^2 | - | 28x | - | 2 |

1. Multiply the 5x^2 by the next divisor term, 2 = 10x^2
2. Subtract and bring the next term of the dividend down

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5x^2 |  |  |  |  |  |  |
| X + 2 | 5x^3 | - | 6x^2 | - | 28x | - | 2 |
|  | 5x^3 | + | 10x^2 |  |  |  |  |
|  |  | - | 16x^2 | - | 28x |  |  |

1. Move on to the next term; what do you need to multiply x by to get -16x^2? -16x

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5x^2 | - | 16x |  |  |  |  |
| X + 2 | 5x^3 | - | 6x^2 | - | 28x | - | 2 |
|  | 5x^3 | + | 10x^2 |  |  |  |  |
|  |  | - | 16x^2 | - | 28x |  |  |

1. Multiply by the next divisor term, 2 = 16x \* 2 = -32x
2. Bring down the next term

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5x^2 | - | 16x | + | 4 |  |  |
| X + 2 | 5x^3 | - | 6x^2 | - | 28x | - | 2 |
|  | 5x^3 | + | 10x^2 |  |  |  |  |
|  |  | - | 16x^2 | - | 28x |  |  |
|  |  | - | 16x^2 | - | 32x |  |  |
|  |  |  |  |  | 4x | - | 2 |
|  |  |  |  |  | 4x | + | 8 |
|  |  |  |  |  |  |  | -10 |

1. As the -10 (remainder), is lower in power than what i’m dividing by, this is a remainder.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5x^2 | - | 16x | + | 4 | r10 |  |
| X + 2 | 5x^3 | - | 6x^2 | - | 28x | - | 2 |

Example

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | X | + | 8 | r11 |  |
| X - 1 | X^2 | + | 7x | + | 3 |
|  | X^2 | - | X |  |  |
|  |  |  | 8x | + | 3 |
|  |  |  | 8x | - | 8 |
|  |  |  |  |  | 11 |