Theorem | **Factor Theorem**

The expression $x - a$ is a linear factor of a polynomial if and only if the value a is a zero of the related polynomial function.

Factor this quadratic $x^2 + 3x - 4 = (x + 4)(x - 1)$

Summary | **Equivalent Statements about Polynomials**

① -4 is a solution of $x^2 + 3x - 4 = 0$.
② -4 is an x-intercept of the graph of $y = x^2 + 3x - 4$.
③ -4 is a zero of $y = x^2 + 3x - 4$.
④ $x + 4$ is a factor of $x^2 + 3x - 4$.

Is 8 a factor of 104? 13 R=0

Yes, the remainder is zero

Is 6 a factor of 81? 13 R=3

No, the remainder is not zero

A number is a factor of another number if and only if the quotient has a remainder of zero

Is $x + 3$ a factor of of the following function?:

Only if the remainder is zero!

$f(x) = 2x^3 + 14x^2 + 19x - 15$?

$-54 + 126 - 57 - 15$

$f(-3) = 0$

Or do the division and R =0

x+3 is therefore, a factor.

If $\frac{2x^3 + 14x^2 + 19x - 15}{x + 3} = 2x^2 + 8x - 5$

then $f(x)=2x^3 + 14x^2 + 19x - 15=(x + 3)(2x^2 + 8x - 5)$

What is the zero of x + 3 ? -3

What should happen if you replace x with -3 ?

$f(-3) = 0$

What if $f(-3) \neq 0$? -3 is not a zero so (x+3) is not a factor!

Is (x - 2) a factor of $5x^3 + 7x^2 - 3x + 8$?

2 -6

When you divide

R=70

(x - 2) NOT a factor

Is x + 2 a factor of $10x^3 - x^2 + 3x - 4$?

NO

remainder is -94

Either perform the division or find f(-2) = -94

What is the remainder of this quotient?

$$\frac{6x^3 + 7x^2 - 8x + 12}{x - 3}$$

Either perform the division or find f(3) = 213

No, the remainder is 213.