POLYNOMIAL THEOREMS

The Factor Theorem

A bridge between roots and factors.

$P(c) = 0$

c is a root

REMAINDER IS ZERO

$P(c) = (c - c) \cdot Q(c) = 0$

$(x - c)$ is a factor of $P(x)$

$P(x) = (x - c) \cdot Q(x)$ with no leftover term

REMAINDER THEOREM (GENERAL CASE)

$$P(x) = (x - c) \cdot Q(x) + P(c)$$

Dividing by $(x - c)$ leaves remainder $P(c)$; the Factor Theorem is the case $P(c) = 0$.

USING THE WRONG SIGN OF c

For $x^3 - 4x + 2$ divided by $(x + 3)$, $P(3) = 17$ is the remainder for $(x - 3)$. Here $c = -3$, so the remainder is $P(-3) = -13$.