

The Remainder Theorem

If a polynomial $P(x)$ is divided by $x - a$ then the remainder is $P(a)$.

Ex 1) Find the remainder: $P(x) = (x^3 - 8x^2 + 5x + 2) \div (x - 2)$

$$\begin{aligned}P(2) &= (2)^3 - 8(2)^2 + 5(2) + 2 \\ &= 8 - 32 + 10 + 2 \\ &= -12\end{aligned}$$

The remainder theorem allows us to find the remainder more quickly by evaluating $P(2)$.

Ex 2) Find the remainder: $(x^3 + 3x^2 - 9x - 12) \div (x + 4)$

$$\begin{aligned}P(-4) &= (-4)^3 + 3(-4)^2 - 9(-4) - 12 \\ &= -64 + 48 + 36 - 12 \\ &= 8\end{aligned}$$