

Consider the polynomial
 $f(x) = ax^3 + bx^2 + cx + d$, $a, b, c, d \in \mathbb{R}, a \neq 0$

Assume that $f(x)$ has 3 real roots

r_1, r_2, r_3 . By writing:

$$ax^3 + bx^2 + cx + d = a(x - r_1)(x - r_2)(x - r_3)$$

prove that:

$$r_1 + r_2 + r_3 = -\frac{b}{a}, \quad r_1 \cdot r_2 + r_2 \cdot r_3 + r_1 \cdot r_3 = \frac{c}{a}$$

$$\text{and} \quad r_1 \cdot r_2 \cdot r_3 = -\frac{d}{a}$$