Basic Math - First lesson Homework

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1. $P(x) = x^5 + x^3 + x^2 + 1 = 0$. Note that $P(-1) = 0$. Use division.
   - Factorization $x^5 + x^3 + x^2 + 1 = (x^2 + 1)(x^3 + 1) = (x + 1)(x^2 + 1)(x^2 - x + 1)$.
   - Solutions $x = -1$.
2. $P(x) = x^5 - 9x^3 - 8x^2 + 72 = 0$. Note that $P(\pm 3) = P(2) = 0$. Use division.
   - Factorization $x^5 - 9x^3 - 8x^2 + 72 = (x + 3)(x - 3)(x - 2)(x^2 + 2x + 4)$.
   - Solutions $x = \pm 3, 2$.
3. $P(x) = x^4 - 3x^3 + 2x - 6 = 0$. Note that $P(3) = 0$. Use division.
   - Factorization $x^4 - 3x^3 + 2x - 6 = (x - 3)(x^3 + 2)$.
   - Solutions $x = 3,\ \pm\sqrt[3]{-2}$.
4. For the parameter $a \in \mathbb{R}$, $P(x) = x^3 - ax^2 - 2x + 2a = 0$. Note that $P(a) = 0$. Use division.
   - Factorization $x^3 - ax^2 - 2x + 2a = (x - a)(x^2 - 2)$.
   - Solutions $x = a,\ \pm\sqrt{2}$.
5. For the parameter $a \in \mathbb{R}$, $P(x) = x^3 - ax^2 - 2x + 2a = 0$. Note that $P(a) = 0$. Use division.
   - Factorization $x^3 - ax^2 - ax + a^2 = (x - a)(x^2 - a)$.
   - Solutions $x = a$ always, if $a \geq 0$ also $\pm\sqrt{a}$.