# Polynomial and Complex Number Practice (Algebra II)

## Instructions

Solve each problem. Show clear work. Aim to finish in 60 minutes or less. When applicable, leave answers in simplest exact form (no rounded decimals).

## Problems

1. List all possible rational roots of $f(x) = 6x^3 - x^2 - 25x + 10$.
2. Find every rational zero of $g(x) = 2x^3 - 7x^2 - 8x + 24$ and factor $g(x)$ completely over the reals.
3. Factor $h(x) = x^4 - 8x^2 + 16$ completely over the reals.
4. Divide $4x^4 - 3x^3 + 7x^2 - 5x + 11$ by $x - 3$, and write the result in the form (quotient) + (remainder)/(divisor).
5. Given $p(x) = x^4 - x^3 - 3x^2 + 55x - 52$ has a root at $x = 2 - 3i$, find all remaining roots and express $p(x)$ as a product of two real quadratic factors.
6. Simplify $\dfrac{5 - 7i}{-2 + 3i}$ into $a + bi$ form.
7. For $y = -3x^2 + 18x + 41$, find the vertex, classify it as a maximum or minimum, and state that extreme value.
8. Factor $q(x) = 2x^3 - x^2 - 22x - 24$ completely over the rationals.
9. Determine whether $(x - 3)$ is a factor of $r(x) = 2x^4 - 13x^3 + 26x^2 - 3x - 36$. If it is, divide to factor once; if not, give the remainder.
10. For $s(x) = 5x^3 - 9x^2 - 11x + 18$, (a) list possible rational roots, (b) find one actual rational root, (c) use it to factor $s(x)$ completely over the reals.
11. A theater charges \$42 per ticket and sells 180 tickets. For each \$3.50 decrease in price, it sells 30 more tickets. (a) Write revenue $R(p)$ as a function of ticket price $p$. (b) Find the price that maximizes revenue and the corresponding maximum revenue.
12. (a) Divide $x^4 - 5x^3 + 6x^2 + 9x - 18$ by $x + 1$. (b) Using the result, factor the polynomial completely over the reals if possible. (c) State all real and complex roots in $a + bi$ form.