

Dividing Polynomials: Remainder and Factor Theorems

Grade 11 – Algebra 2 math · Test · Standards: A-APR.B.2, A-APR.D.6, A-APR.C.4

Name: _____ Date: _____ Class: _____

This test covers polynomial long division, synthetic division, the Remainder and Factor Theorems, and polynomial identities. Show each division step, include zero coefficients for missing terms, and check answers when time allows. No calculator is needed. The test is worth 20 points.

Standards: A-APR.B.2, A-APR.D.6, A-APR.C.4 · **Level:** Grade 11 Algebra 2

Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Long division (3 points)

Use long division to divide $x^3 - 2x^2 - 9x + 25$ by $x + 3$. State the quotient and the remainder.

Question 2 Synthetic division (3 points)

Use synthetic division to divide $3x^4 - 2x^2 + 5x - 9$ by $x + 2$.

Question 3 Remainder Theorem (2 points)

Let $f(x) = x^4 - 3x^3 + 2x - 5$. Find the remainder when f is divided by $x - 2$ and by $x + 1$, without dividing.

Question 4 Factor Theorem (3 points)

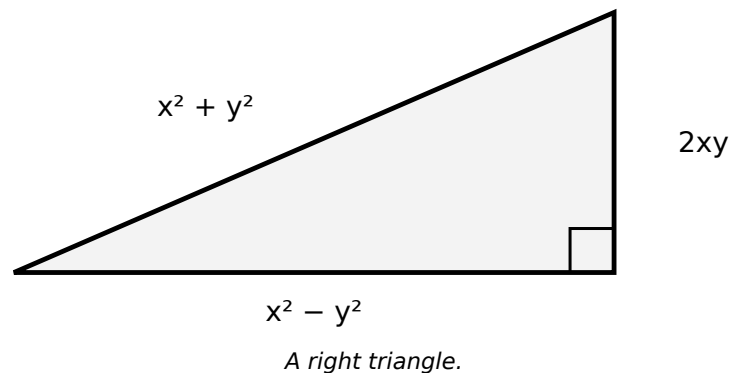
Show that $x - 4$ is a factor of $f(x) = x^3 - 5x^2 - 2x + 24$, and then factor $f(x)$ completely.

Question 5 An unknown coefficient (2 points)

Find k so that $x + 3$ is a factor of $x^3 + kx^2 - 2x + 12$.

Question 6 Polynomial identity (3 points)

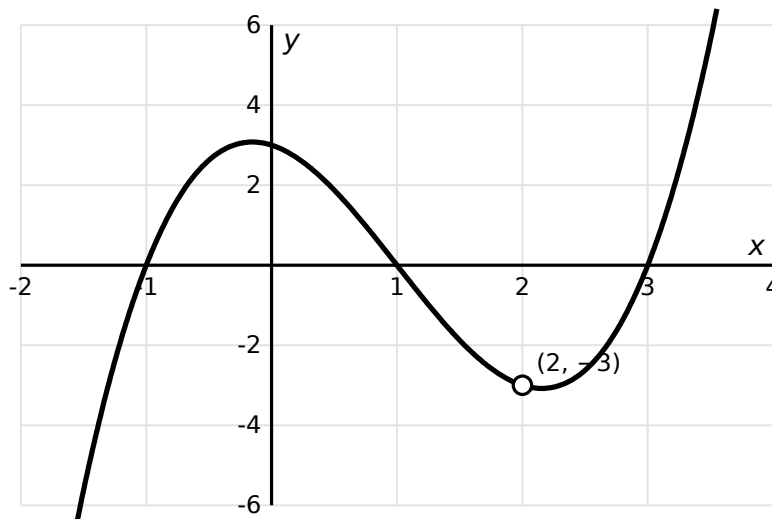
The figure shows a right triangle whose sides are given in terms of x and y .



- Prove $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ by expanding. (2 points)
- Find the side lengths when $x = 4$ and $y = 1$. (1 point)

Question 7 Remainders from a graph (2 points)

The graph of $f(x) = x^3 - 3x^2 - x + 3$ is shown with the point $(2, -3)$.



Graph of f .

- State the remainder when f is divided by $x - 2$ and by $x - 3$. (1 point)
- Name every linear factor of f that the graph shows. (1 point)

Question 8 Volume of a prism (2 points)

A rectangular prism has volume $x^3 + 9x^2 + 26x + 24$ and height $x + 2$. Find the expression for the area of its base and factor it into length and width.