

Polynomial and Rational Functions: Zeros and Asymptotes

Grade 12 – Precalculus math · Test · Standards: A-APR.B.2, A-APR.B.3, F-IF.C.7c, F-IF.C.7d, N-CN.C.9

Name: _____ Date: _____ Class: _____

This 45-minute test has 9 questions worth 20 points. It covers finding zeros, conjugate pairs, graphs, asymptotes and inequalities. Show factoring steps and sign charts, because partial credit follows the reasoning.

Standards: A-APR.B.2, A-APR.B.3, F-IF.C.7c, F-IF.C.7d, N-CN.C.9 · **Level:** Grade 12 Precalculus

Time: 45 minutes · 9 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Find All Zeros (2 points)

Find all zeros of $P(x) = 2x^3 + x^2 - 13x + 6$.

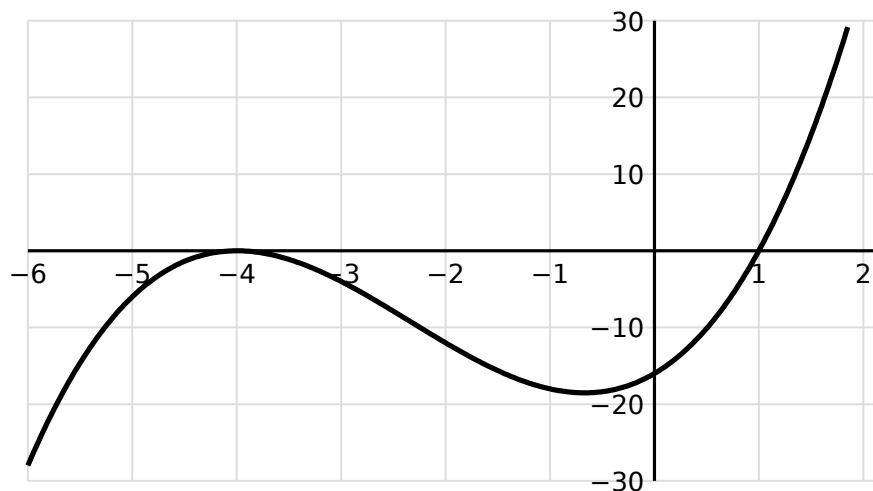
Question 2 Conjugate Zeros and Intercepts (2 points)

Suppose Q has degree 4 and real coefficients, and two of its zeros are $1 + 3i$ and $-2i$.

- Name the other two zeros. (1 point)
- How many x-intercepts does its graph have? Explain. (1 point)

Question 3 Zeros and End Behavior from a Graph (2 points)

The graph shows a degree-3 polynomial that touches the x-axis at -4 and crosses it at 1 .



Graph of a cubic polynomial.

- Find the multiplicity of each zero. (1 point)
- Describe the end behavior and write a possible equation. (1 point)

Question 4 Slant and Vertical Asymptotes (2 points)

Let $f(x) = \frac{(4x^2 - 5x + 3)}{(x - 1)}$. Find the slant asymptote and the vertical asymptote.

Question 5 Polynomial Inequality (2 points)

Solve $2x^3 - x^2 - 15x \leq 0$.

Question 6 Rational Inequality (3 points)

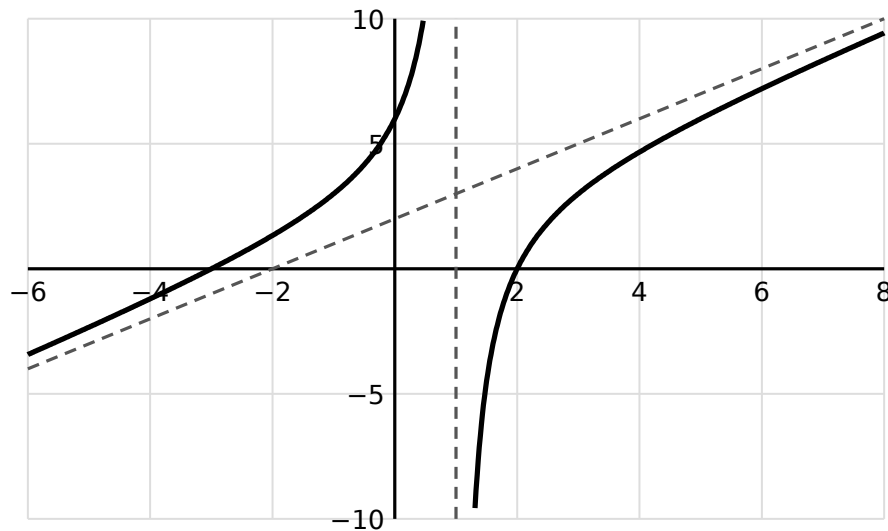
Solve $\frac{(x + 4)}{(x - 1)} < 3$, giving the solution set as intervals.

Question 7 Build a Polynomial (2 points)

Write the monic polynomial of least degree with real coefficients that has a double zero at -1 and a zero at $3i$. Expand to standard form.

Question 8 Analyze a Rational Function (3 points)

The graph of $f(x) = \frac{(x^2 + x - 6)}{(x - 1)}$ is shown with its dashed asymptotes.



Graph of the rational function.

- Write the equation of the vertical asymptote. (1 point)
- Use division to find the slant asymptote. (1 point)
- Find the x-intercepts. (1 point)

Question 9 Unit Cost Over Time (2 points)

A workshop's average cost per item is $A(n) = \frac{(5n + 1200)}{n}$ dollars for n items.

- Find the horizontal asymptote and say what it means. (1 point)
- How many items make the average cost at most \$15? (1 point)