

Precalculus · Polynomial and Rational Functions in Depth · Test Answer Key

Common Core A-APR.B.2, A-APR.B.3, F-IF.C.7c, F-IF.C.7d, N-CN.C.9 · mathovore.fr

This precalculus polynomial rational test answer key gives the full solution and the scoring guide for each of the 9 test questions on polynomial and rational functions in depth.

Use this key to score the polynomial and rational functions test out of 20 points. Each solution gives the full method and a scoring guide, so award partial credit for correct steps even when the final answer has an arithmetic slip.

Precalculus Common Core: A-APR.B.2 · A-APR.B.3 · F-IF.C.7c · F-IF.C.7d · N-CN.C.9

Precalculus Polynomial Rational Test Answer Key: questions 1-5

Question 1: Rational Root Theorem (3 points)

a. The constant term 6 has divisors 1, 2, 3, 6 and the leading coefficient 2 has divisors 1, 2.

The candidates are $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$: **12**

b. $P(2) = 16 + 4 - 26 + 6 = 0$. Division gives $2x^2 + 5x - 3 = (2x - 1)(x + 3)$. Zeros: 2, $\frac{1}{2}$, -3

Scoring: Part (a): 1 point. Part (b): 1 point for finding a first zero with a valid test or division, 1 point for the complete set of three zeros.

Question 2: Complex zeros of a quartic (2 points)

$x^4 - 16 = (x^2 - 4)(x^2 + 4) = (x - 2)(x + 2)(x^2 + 4)$. The zeros are 2, -2 , $2i$, $-2i$.

Scoring: 1 point for a correct factorization; 1 point for all four zeros (half credit for only the real zeros).

Question 3: Build a polynomial (2 points)

The conjugate $1 - 3i$ is a zero. Then $(x - (1 + 3i))(x - (1 - 3i)) = x^2 - 2x + 10$, and $(x - 4)(x^2 - 2x + 10) = x^3 - 6x^2 + 18x - 40$.

Answer: $x^3 - 6x^2 + 18x - 40$.

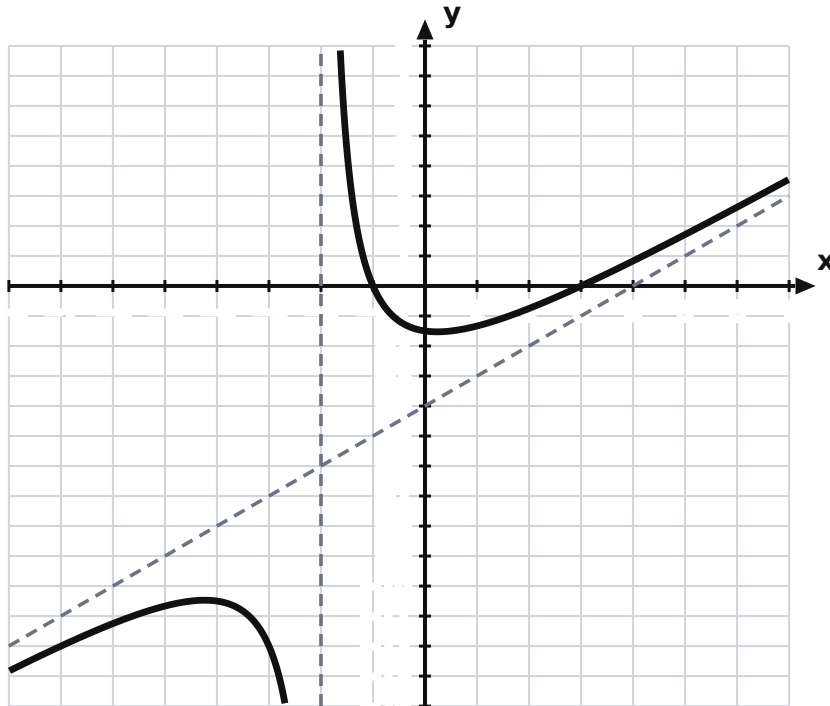
Scoring: 1 point for using the conjugate zero and the correct quadratic factor; 1 point for the correct final polynomial.

Question 4: Read a polynomial graph (2 points)

- The graph crosses at -2 : **odd**. It touches at 1 : **even**.
- Least degree $1+2=3$, and the ends go in opposite directions with the right end falling: **degree 3, negative leading coefficient**.

Scoring: Part (a): 1 point for both multiplicities. Part (b): 1 point for degree 3 with the correct sign.

Question 5: Asymptotes from a graph and a rule (2 points)



Asymptotes $x = -2$ and $y = x - 4$.

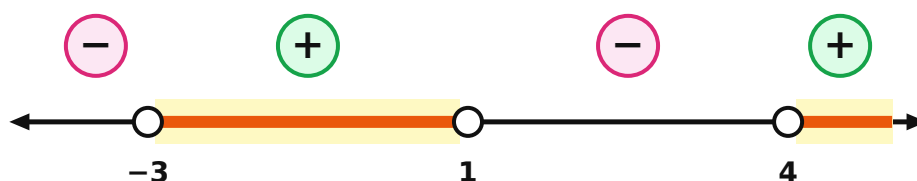
- The denominator is zero at $x = -2$ and the numerator is 5 there: $x = -2$
- Divide: $x^2 - 2x - 3 = (x + 2)(x - 4) + 5$, so the slant asymptote is $y = x - 4$.

Scoring: 1 point for each equation; accept an equivalent form such as $y = -4 + x$.

Precalculus Polynomial Rational Test Answer Key: questions 6-9

Question 6: Cubic inequality (3 points)

Critical numbers: $-3, 1, 4$. At $x = 0$ the product is $(3)(-1)(-4) = 12 > 0$, so the signs run $-, +, -, +$.



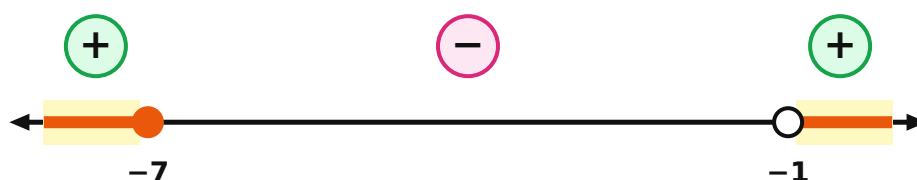
Open circles because the inequality is strict.

Answer: $(-3, 1) \cup (4, \infty)$.

Scoring: 1 point for the critical numbers, 1 point for correct signs on the intervals, 1 point for the interval notation with open endpoints.

Question 7: Rational inequality (3 points)

Subtract 2: $\frac{x-5}{x+1} - 2 = \frac{x-5-2x-2}{x+1} = \frac{-x-7}{x+1} \leq 0$, which is $\frac{x+7}{x+1} \geq 0$.

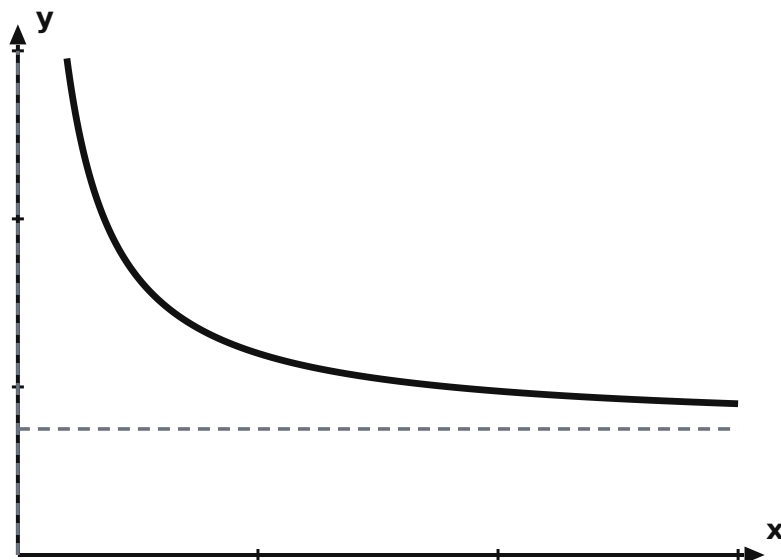


Closed at -7 (a zero), open at -1 (undefined).

Answer: $(-\infty, -7] \cup (-1, \infty)$. Check $x = 0$: $-5 \leq 2$.

Scoring: 1 point for moving everything to one side and combining; 1 point for the sign analysis; 1 point for the correct intervals with correct endpoints.

Question 8: Average cost model (2 points)



Asymptote $A = 15$.

- a. $A(x) = 15 + \frac{900}{x}$, so $y = 15$: the average cost per shirt approaches \$15.
 b. $15x + 900 \leq 20x$ gives $x \geq 180$. Answer: **180 shirts**

Scoring: Part (a): 1 point for the asymptote and its meaning. Part (b): 1 point for the correct inequality solution.

Question 9: Conjugate zeros (1 point)

Nonreal zeros come in conjugate pairs: $1+i$ and $-3i$. The five zeros are 2, $1 \pm i$, $\pm 3i$.

Scoring: 1 point for both zeros (no credit if only one is given).

Scoring summary

Total
20 points: add the points of every question of this precalculus polynomial rational test answer key.

How to use this precalculus polynomial rational test answer key

Use this precalculus polynomial rational test answer key to score the test fairly and to see which skills need more practice.

