

Precalculus - Rational Functions and Asymptotes

- Test Answer Key

Common Core A-APR.D.7, F-IF.C.7d, A-CED.A.1 · maths-pdf.fr/en/

Worked solutions and scoring notes for the 9-question rational functions test. Use the scoring line under each solution to award partial credit.

Precalculus · Common Core State Standards: **A-APR.D.7, F-IF.C.7d, A-CED.A.1**

Question 1 - Domain and vertical asymptotes [2 pts]

$x^2 - 9 = 0$ at $x = \pm 3$. Neither cancels with $x - 4$.

Domain $x \neq \pm 3$; **asymptotes** $x = 3$ and $x = -3$

Scoring: 1 point for the domain, 1 point for the asymptotes.

Question 2 - Horizontal asymptotes [2 pts]

(a) Equal degrees: $\frac{5}{2}$. (b) Lower numerator degree: 0.

(a) $y = \frac{5}{2}$; **(b)** $y = 0$

Scoring: 1 point each.

Question 3 - Hole and asymptote [2 pts]

$f(x) = \frac{(x-3)(x+2)}{(x-3)(x+1)}$. Hole at $x = 3$, $y = \frac{5}{4}$. Asymptote $x = -1$.

Hole $(3, \frac{5}{4})$; **asymptote** $x = -1$

Scoring: 1 point for the hole (both coordinates), 1 point for the asymptote.

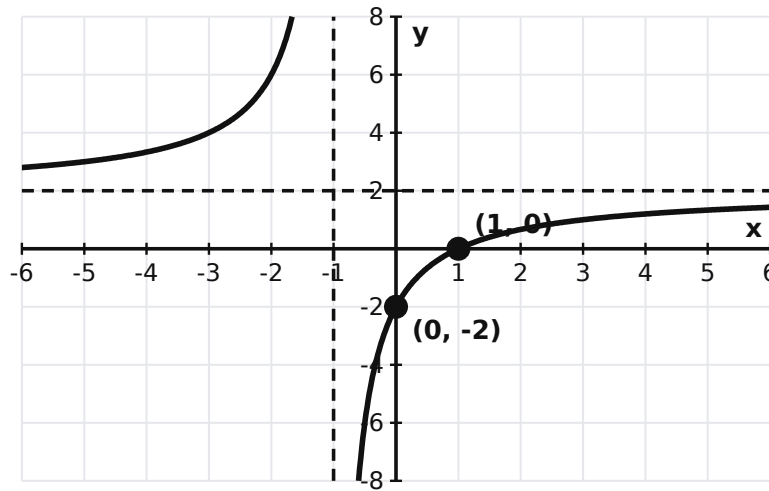
Question 4 - Slant asymptote [2 pts]

Synthetic division with $c = -1$: $2, 3, -1 \rightarrow 2, 1, -2$. The quotient is $2x + 1$ with remainder -2 .

$y = 2x + 1$

Scoring: 1 point for dividing, 1 point for the line.

Question 5 - Read a rational graph [3 pts]



Asymptotes $x = -1$ and $y = 2$.

(a) $x = -1$ and $y = 2$. (b) $(1, 0)$ and $(0, -2)$. (c) The domain excludes -1 ; the range excludes 2 .

$x = -1, y = 2; (1, 0), (0, -2);$ **domain** $x \neq -1$, **range** $y \neq 2$

Scoring: 1 point for each part.

Question 6 - Solve a rational equation [2 pts]

$4(x-2) = 3(x+1)$, $4x-8 = 3x+3$, $x = 11$. Check: $\frac{4}{12} = \frac{1}{3}$ and $\frac{3}{9} = \frac{1}{3}$.

$x = 11$

Scoring: 1 point for clearing the fractions, 1 point for the check and answer.

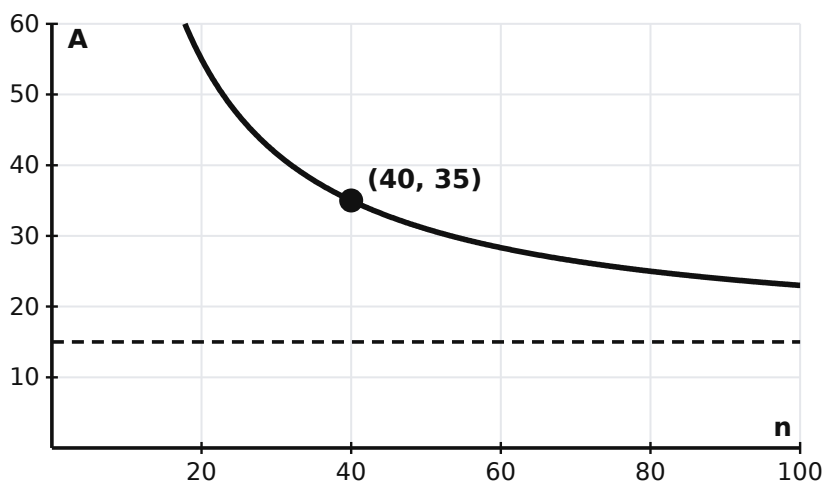
Question 7 - Extraneous solution [2 pts]

$x = 2 + 3(x-2)$, so $x = 3x - 4$ and $x = 2$. But $x = 2$ makes the denominators zero.

No solution

Scoring: 1 point for solving, 1 point for rejecting the extraneous value.

Question 8 - Average cost [3 pts]



At $n = 40$ the average is 35 dollars.

(a) $\frac{800+600}{40} = 35$. (b) $y = 15$: the average approaches the per-item cost. (c) $800+15n = 20n$, $n = 160$.

\$35; $y = 15$; 160 bracelets

Scoring: 1 point for each part.

Question 9 - Rational inequality [2 pts]

Critical values -3 and 1 . Test $x = 0$: $\frac{3}{-1} < 0$. Test $x = -4$: $\frac{-1}{-5} > 0$. Test $x = 2$: $\frac{5}{1} > 0$.

$(-3, 1)$

Scoring: 1 point for the sign test, 1 point for the interval.

Total

20 points