

Precalculus - Polynomial Functions and Their Graphs - Test Answer Key

Common Core F-IF.C.7c, A-APR.B.3, F-IF.B.4 · maths-pdf.fr/en/

Worked solutions and scoring notes for the 9-question polynomial graphs test. Use each scoring line to award partial credit.

Precalculus · Common Core State Standards: **F-IF.C.7c, A-APR.B.3, F-IF.B.4**

Question 1 - Degree and end behavior [2 pts]

Degree 3 with leading coefficient -5 : odd degree and negative, so the left end rises and the right end falls.

Degree 3; -5 ; $f(x) \rightarrow \infty$ as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ as $x \rightarrow \infty$

Scoring: 1 point for degree and leading coefficient, 1 point for end behavior.

Question 2 - Zeros and multiplicity [2 pts]

-2 : multiplicity 2, touches. 5 : multiplicity 1, crosses.

-2 (touch), 5 (cross)

Scoring: 1 point for each zero.

Question 3 - Factor and solve [2 pts]

$$x^2(x-4)-9(x-4)=(x-4)(x-3)(x+3).$$

$$x=4, 3, -3$$

Scoring: 1 point for factoring by grouping, 1 point for all three zeros.

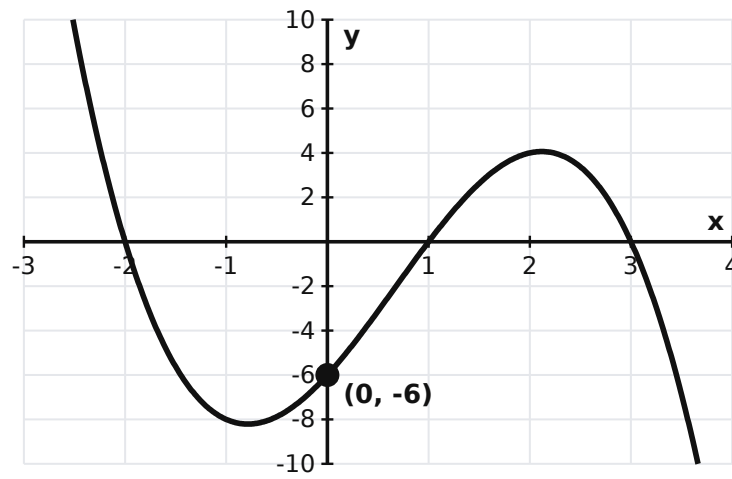
Question 4 - Write a polynomial [2 pts]

$$(x+2)(x-1)(x-3)=(x^2+x-2)(x-3)=x^3-2x^2-5x+6.$$

$$x^3-2x^2-5x+6$$

Scoring: 1 point for the factors, 1 point for the expansion.

Question 5 - Read a graph [3 pts]



Zeros at -2, 1 and 3.

(a) $-2, 1, 3$. (b) Three simple zeros give degree 3; the left end rises and the right end falls, so $a < 0$. (c) $g(x) = a(x+2)(x-1)(x-3)$ and $g(0) = 6a = -6$, so $a = -1$.

$-2, 1, 3$; **degree 3**, $a < 0$; $g(x) = -(x+2)(x-1)(x-3)$

Scoring: 1 point for each part.

Question 6 - Polynomial inequality [2 pts]

Zeros $-1, 3, 5$. Test: $x = -2$ gives negative; $x = 0$ gives $(1)(-3)(-5) > 0$; $x = 4$ gives $(5)(1)(-1) < 0$; $x = 6$ gives positive. Include the zeros.

$(-\infty, -1] \cup [3, 5]$

Scoring: 1 point for the sign test, 1 point for correct intervals with endpoints.

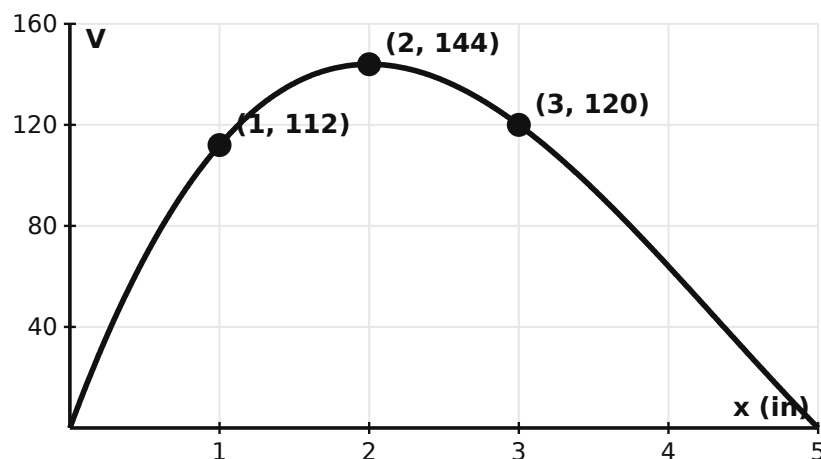
Question 7 - Intermediate Value Theorem [2 pts]

$f(1) = 1 + 2 - 5 = -2$ and $f(2) = 8 + 4 - 5 = 7$. The values have opposite signs and f is continuous.

A zero lies between 1 and 2

Scoring: 1 point for each correct value, shown with the sign conclusion in the second point.

Question 8 - Box volume [3 pts]



Three computed points.

(a) $V(1) = 1(8)(14) = 112$; $V(2) = 2(6)(12) = 144$. (b) $0 < x < 5$. (c) $V(3) = 3(4)(10) = 120$; the greatest is at $x = 2$.

112, 144; $0 < x < 5$; 120; $x = 2$

Scoring: 1 point for each part.

Question 9 - Multiplicity and degree [2 pts]

Degree $2+3+1=6$. $x=0$: even, touches. $x=3$: odd, crosses (flattens). $x=-1$: odd, crosses.

Degree 6; touch at 0, cross at 3 and -1

Scoring: 1 point for the degree, 1 point for the behavior at the three zeros.

Total
20 points