CHAPTER 3.2

Polynomial Functions and Their Graphs

Multiple-Choice Old Exam Questions

10 questions • 3 topics • options A–E • two questions per page

Topic 1 | End Behavior

Far-left and far-right behavior of polynomial graphs • Questions 1–2

Q **1**

The far-left and far-right behavior of the graph of the polynomial $p(x) = -2(x-3)(x+1)^2(2-x)$ is as follows:

A) up to the left and up to the right

B) up to the left and down to the right

C) down to the left and up to the right

D) down to the left and down to the right

E) none of the above

Q **2**

The far-left and far-right behavior of the graph of the polynomial $p(x) = -2x(x-1)^2(x^2+1)$ is:

A) up to its far left and down to its far right

B) down to its far left and up to its far right

C) up to its far left and up to its far right

D) down to its far left and down to its far right

E) none of the other answers

Topic 2 | Zeros, Multiplicity and the Sign of a Polynomial

Crossing or touching the x-axis, counting intercepts, and where a graph lies above the x-axis • Questions 3–8

Q 3

Let $p(x) = x^3(x^2 - 1)(3x - 2)^5(x^2 + 4x + 2)^2$. The number of points where the graph of $p(x)$ crosses the x-axis is

A) 4

B) 3

C) 5

D) 8

E) 10

Q 4

Which one of the following is true about the graph of the polynomial function $f(x) = x^2(x - 3)^3(x + 1)$?

A) The graph crosses the x-axis at two points.

B) The graph has y-intercept -27.

C) The graph crosses the x-axis at three points.

D) The graph lies above the x-axis in the interval $(-1, 3)$.

E) The graph is increasing in the interval $(-\infty, -1]$.

Q
5

If $f(x) = -x(x^2 - 4)^2(x^2 + 1)^4$, then the graph of $f(x)$ will touch but not cross the x-axis at

A) two points

B) six points

C) four points

D) no point

E) one point

Q
6

The graph of the polynomial $p(x) = x^4 - x^3 - 2x^2$ is:

A) tangent to the x-axis at $x = 0$ and below or on the x-axis on the interval $[-1, 2]$

B) tangent to the x-axis at $x = 0$ and above or on the x-axis on the interval $(-1, 2)$

C) tangent to the x-axis at $x = 0$ and below the x-axis on the intervals $(-1, 0)$ and $(2, \infty)$

D) above the x-axis on the intervals $(-1, 0)$ and $(2, \infty)$

E) below the x-axis on the intervals $(-\infty, -1)$ and $(0, \infty)$

Q **7**

The graph of $f(x) = -x^3 + 3x^2 + 9x - 27$ lies above the x-axis on the interval

A) $(-\infty, -3)$

B) $(-3, 3)$

C) $(-\infty, -3) \cup (3, \infty)$

D) $(-\infty, 3)$

E) $(-3, \infty)$

Q **8**

The graph of the function $f(x) = -(4 - x)^3(x + 3)^2$ lies above the x-axis on the interval

A) $(4, \infty)$

B) $(-\infty, -3) \cup (4, \infty)$

C) $(-\infty, \infty)$

D) $(-3, \infty)$

E) $(-\infty, 4)$

Topic 3 | Intermediate Value Theorem

Locating a real zero in an interval by a sign change • Questions 9–10

Q **9**

By the Intermediate Value Theorem, the polynomial $p(x) = 3x^3 + 7x^2 + 3x + 7$ has at least one zero in the interval

A) $[-3, -2]$

B) $[-2, -1]$

C) $[-1, 0]$

D) $[1, 2]$

E) $[0, 1]$

Q **10**

The function $f(x) = -x^3 + x - 3$ has a real zero on

A) $[0, 1]$

B) $[-2, -1]$

C) $[-1, 0]$

D) $[1, 2]$

E) $[-1, 2]$

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	2	**A**	up to the left and up to the right
2	10	**A**	up to its far left and down to its far right
3	3	**A**	4
4	4	**A**	The graph crosses the x-axis at two points.
5	6	**A**	two points
6	8	**A**	tangent to the x-axis at $x = 0$ and below or on the x-axis on the interval $[-1, 2]$
7	1	**A**	$(-\infty, -3)$
8	5	**A**	$(4, \infty)$
9	7	**A**	$[-3, -2]$
10	9	**B**	$[-2, -1]$