3.2: Polynomial Functions and their Graphs

1. 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) $(-3, \infty)$

2. If x_1 is the largest real zero of $p(x) = 2x^3 + 7x^2 + 2x - 3$, then the value of $12x_1 + 5$ is equal to

   A) 11

   B) $-7/2$

   C) $-9/2$

   D) 41

   E) 17

3. If $f(x)$ is a polynomial of degree 3 with real coefficients and having $-3,1,4$ and $f(2) = 30$, then $f(x) =$

A) $-3x^3 + 6x^2 + 33x - 36$

B) $-3x^3 - 2x^2 - 11x + 12$

C) $-x^3 + 2x^2 + 11x - 12$

D) $x^3 - 2x^2 - 11x + 12$

E) $3x^3 - 6x^2 - 33x + 36$

4. The far-left and the 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

5. 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

6. 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 at -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 $(-\infty, -1]$

7. The set of all x for which the graph of the function $f(x) = -(4 - x)^3(x + 3)^2$ is completely above the x-axis on the interval:

A) $(4, \infty)$

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

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

D) $(-3, \infty)$

E) $(-\infty, 4)$

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

A) two points

B) six points

C) four points

D) no point

E) one point

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) $[0,1]$

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

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

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

C) tangent to x-axis at $x = 0$ and is 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 $(0, \infty)$

11. 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) $[-1,2]$

12. The far-left and the 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.

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

A) $(4, \infty)$

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

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

D) $(-3, \infty)$

E) $(-\infty, 4)$