This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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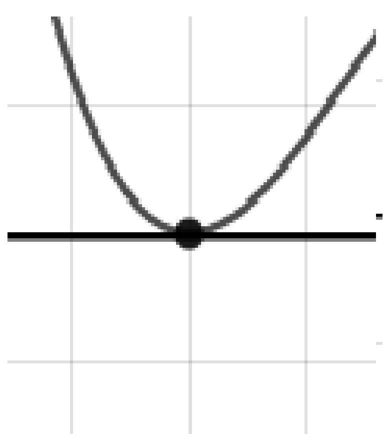
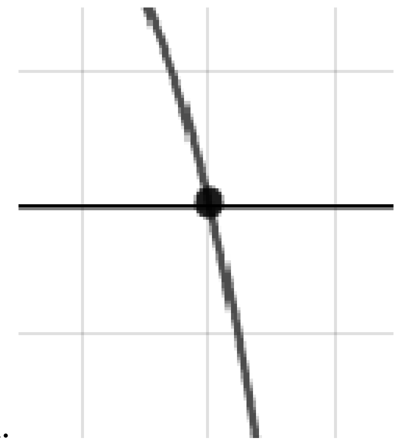
26. Describe the zero behavior of the zero $x = 6$ of the polynomial below.

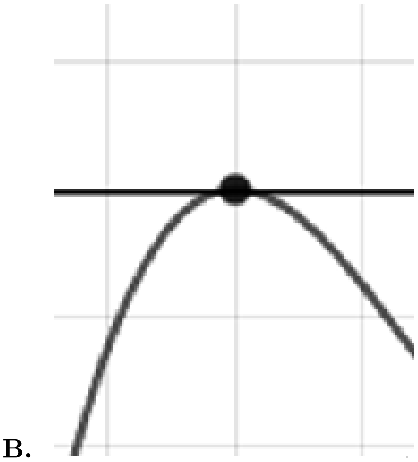
$$f(x) = 4(x-3)^7(x+3)^6(x-6)^{10}(x+6)^9$$

The solution is

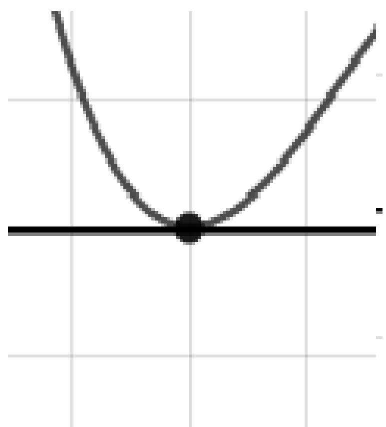




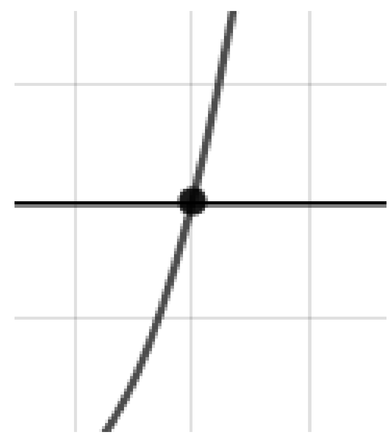
A.



B.



C.



D.

E. None of the figures above.

A.

B.

C.

D.

General Comments: You will need to sketch the entire graph, then zoom in on the zero the question asks about.

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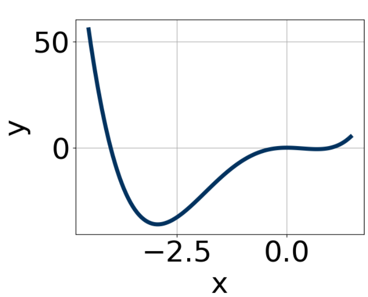
27. Which of the following equations *could* be of the graph presented below?



The solution is $14x^8(x-1)^5(x+4)^9$

A. $14x^4(x-1)^6(x+4)^7$

The factor $(x-1)$ should have an odd power.

B. $14x^8(x-1)^5(x+4)^9$

* This is the correct option.

C. $18x^5(x-1)^4(x+4)^{11}$

The factor 0 should have an even power and the factor 1 should have an odd power.

D. $-19x^{10}(x-1)^{11}(x+4)^{11}$

This corresponds to the leading coefficient being the opposite value than it should be.

E. $-9x^4(x-1)^9(x+4)^8$

The factor $(x+4)$ should have an odd power and the leading coefficient should be the opposite sign.

General Comments: Draw the x-axis to determine which zeros are touching (and so have even multiplicity) or cross (and have odd multiplicity).

---

28. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-3 + 2i \text{ and } -1$$

The solution is $x^3 + 7x^2 + 19x + 13$

A. $b \in [-4, 2], c \in [-2, 0], \text{ and } d \in [-6, 1]$

$x^3 + x^2 - x - 2$, which corresponds to multiplying out $(x-2)(x+1)$.

B. $b \in [-8, -2], c \in [18, 27], \text{ and } d \in [-16, -12]$

$x^3 - 7x^2 + 19x - 13$, which corresponds to multiplying out $(x-(-3+2i))(x-(-3-2i))(x-1)$.

C. $b \in [4, 9], c \in [18, 27], \text{ and } d \in [4, 14]$

* $x^3 + 7x^2 + 19x + 13$, which is the correct option.

D. $b \in [-4, 2], c \in [2, 9], \text{ and } d \in [0, 4]$

$x^3 + x^2 + 4x + 3$, which corresponds to multiplying out $(x+3)(x+1)$.

E. None of the above.

This corresponds to making an unanticipated error or not understanding how to use nonreal complex numbers to create the lowest-degree polynomial. If you chose this and are not sure what you did wrong, please contact the coordinator for help.

General Comments: Remember that the conjugate of $a + bi$ is $a - bi$. Since these zeros always come in pairs, we need to multiply out $(x-(-3+2i))(x-(-3-2i))(x-(-1))$.

---

29. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$5, \frac{-2}{3}, \text{ and } \frac{-3}{2}$$

The solution is $6x^3 - 17x^2 - 59x - 30$

A. $a \in [1, 10], b \in [-19, -11], c \in [-60, -48],$ and $d \in [25, 33]$

$6x^3 - 17x^2 - 59x + 30$, which corresponds to multiplying everything correctly except the constant term.

B. $a \in [1, 10], b \in [-19, -11], c \in [-60, -48],$ and $d \in [-33, -29]$

* $6x^3 - 17x^2 - 59x - 30$, which is the correct option.

C. $a \in [1, 10], b \in [32, 40], c \in [17, 20],$ and $d \in [-33, -29]$

$6x^3 + 35x^2 + 19x - 30$, which corresponds to multiplying out $(x+1)(3x+3)(2x-2)$.

D. $a \in [1, 10], b \in [9, 21], c \in [-60, -48],$ and $d \in [25, 33]$

$6x^3 + 17x^2 - 59x + 30$, which corresponds to multiplying out $(x+5)(3x-2)(2x-3)$.

E. $a \in [1, 10], b \in [39, 46], c \in [69, 83],$ and $d \in [25, 33]$

$6x^3 + 43x^2 + 71x + 30$, which corresponds to multiplying out $(x+1)(3x-3)(2x-2)$.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(x-5)(3x+2)(2x+3)$

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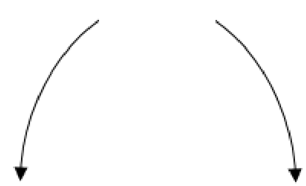
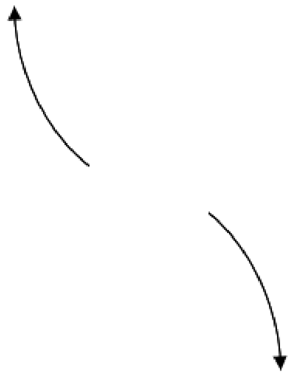
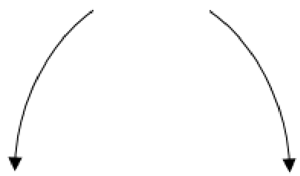
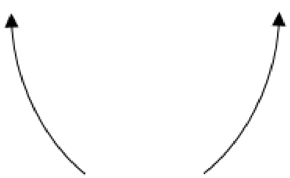
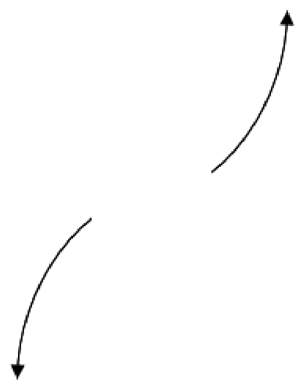
30. Describe the end behavior of the polynomial below.

$$f(x) = -7(x-6)^3(x+6)^8(x+9)^5(x-9)^6$$

The solution is



 **A.**	 **B.**
 **C.**	 **D.**
E. None of the figures above.	

A. The function is above the x-axis, then passes through.

B. The function is below the x-axis, then touches.

C. The function is above the x-axis, then touches.

D. The function is below the x-axis, then passes through.

General Comments: Remember that end behavior is determined by the leading coefficient AND whether the **sum** of the multiplicities is positive or negative.