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

$$-5 + 4i \text{ and } -4$$

The solution is $x^3 + 14x^2 + 81x + 164$

A. $b \in [13, 20], c \in [77, 87], \text{ and } d \in [161, 165]$

   * $x^3 + 14x^2 + 81x + 164$, which is the correct option.

B. $b \in [-22, -9], c \in [77, 87], \text{ and } d \in [-169, -163]$

   $x^3 - 14x^2 + 81x - 164$, which corresponds to multiplying out $(x - (-5 + 4i))(x - (-5 - 4i))(x - 4)$.

C. $b \in [-5, 7], c \in [-2, 4], \text{ and } d \in [-17, -8]$

   $x^3 + x^2 - 16$, which corresponds to multiplying out $(x - 4)(x + 4)$.

D. $b \in [-5, 7], c \in [7, 11], \text{ and } d \in [19, 22]$

   $x^3 + x^2 + 9x + 20$, which corresponds to multiplying out $(x + 5)(x + 4)$.

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 $(x - (-5 + 4i))(x - (-5 - 4i))(x - (-4))$.

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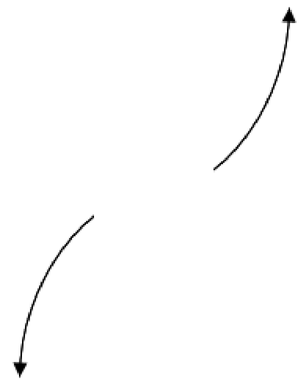
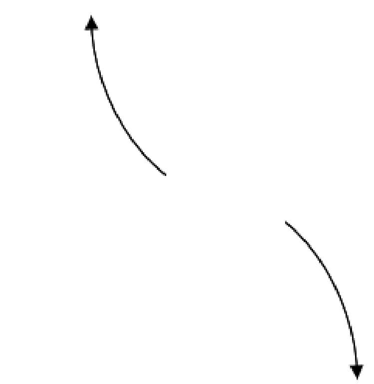
27. Describe the end behavior of the polynomial below.

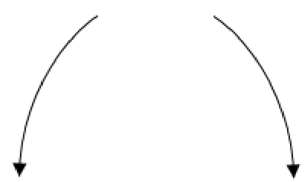
$$f(x) = 9(x - 6)^3(x + 6)^4(x + 5)^2(x - 5)^4$$

The solution is

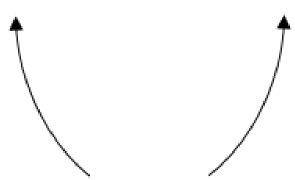




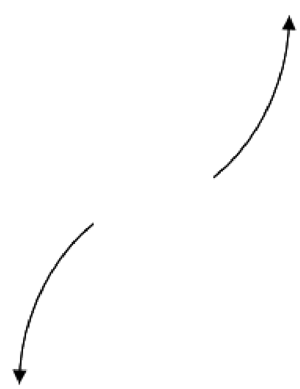
A.



B.



C.



D.

E. None of the figures above.

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

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

$$\frac{-1}{2}, 6, \text{ and } \frac{-1}{4}$$

The solution is $8x^3 - 42x^2 - 35x - 6$

A. $a \in [0, 16], b \in [43, 49], c \in [-17, -4],$ and $d \in [-15, -3]$

$8x^3 + 46x^2 - 13x - 6$, which corresponds to multiplying out $(2x + 2)(x + 1)(4x - 4)$.

B. $a \in [0, 16], b \in [-49, -38], c \in [-41, -25],$ and $d \in [-15, -3]$

* $8x^3 - 42x^2 - 35x - 6$, which is the correct option.

C. $a \in [0, 16], b \in [-49, -38], c \in [-41, -25],$ and $d \in [1, 9]$

$8x^3 - 42x^2 - 35x + 6$, which corresponds to multiplying everything correctly except the constant term.

D. $a \in [0, 16], b \in [41, 44], c \in [-41, -25],$ and $d \in [1, 9]$

$8x^3 + 42x^2 - 35x + 6$, which corresponds to multiplying out $(2x - 1)(x + 6)(4x - 1)$.

E. $a \in [0, 16], b \in [-57, -48], c \in [10, 13],$ and $d \in [1, 9]$

$8x^3 - 50x^2 + 11x + 6$, which corresponds to multiplying out $(2x + 2)(x - 1)(4x - 4)$.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(2x+1)(x-6)(4x+1)$

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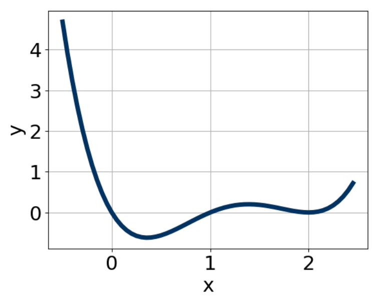
29. Which of the following equations *could* be of the graph presented below?



The solution is $7x^9(x - 2)^8(x - 1)^9$

A. $-14x^7(x - 2)^6(x - 1)^5$

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

B. $-3x^8(x - 2)^4(x - 1)^7$

The factor x should have an odd power and the leading coefficient should be the opposite sign.

C. $7x^9(x - 2)^8(x - 1)^9$

* This is the correct option.

D. $19x^9(x - 2)^7(x - 1)^4$

The factor 2 should have an even power and the factor 1 should have an odd power.

E. $9x^7(x - 2)^{10}(x - 1)^8$

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

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

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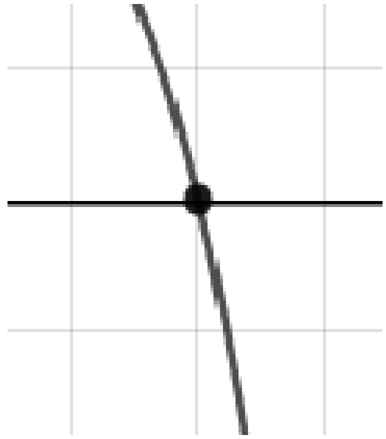
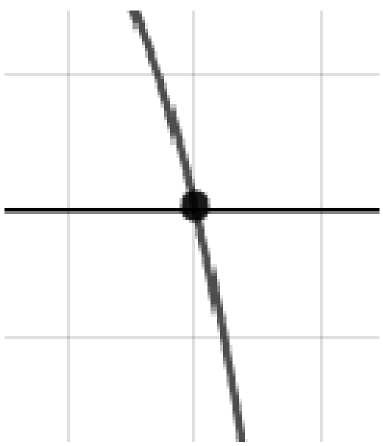
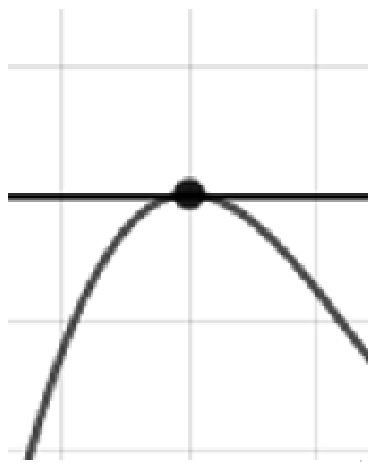
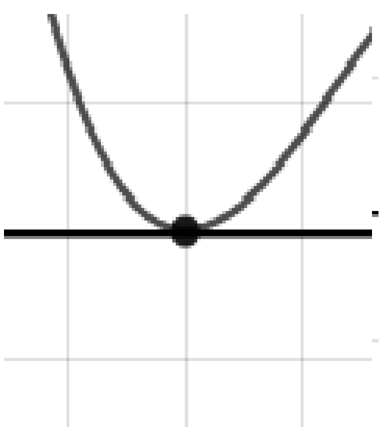
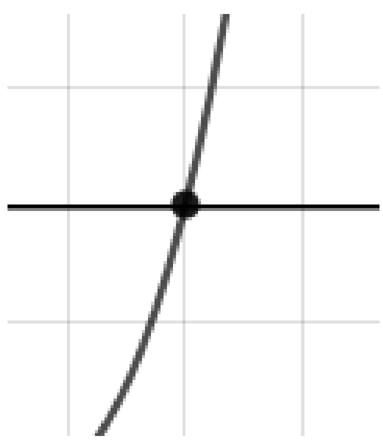
30. Describe the zero behavior of the zero $x = -6$ of the polynomial below.

$$f(x) = 6(x+6)^3(x-6)^4(x+3)^4(x-3)^7$$

The solution is



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

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