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 $x^3 + bx^2 + cx + d$.

$$-4 + 3i \text{ and } -2$$

The solution is $x^3 + 10x^2 + 41x + 50$

A. $b \in [0, 3], c \in [0, 15], \text{ and } d \in [5, 16]$

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

B. $b \in [2, 11], c \in [39, 42], \text{ and } d \in [45, 57]$

* $x^3 + 10x^2 + 41x + 50$, which is the correct option.

C. $b \in [-16, -5], c \in [39, 42], \text{ and } d \in [-57, -42]$

$x^3 - 10x^2 + 41x - 50$, which corresponds to multiplying out $(x - (-4 + 3i))(x - (-4 - 3i))(x - 2)$.

D. $b \in [0, 3], c \in [-2, 3], \text{ and } d \in [-7, -3]$

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

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 $(x - (-4 + 3i))(x - (-4 - 3i))(x - (-2))$.

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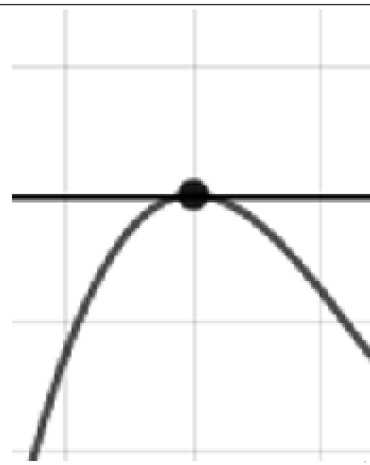
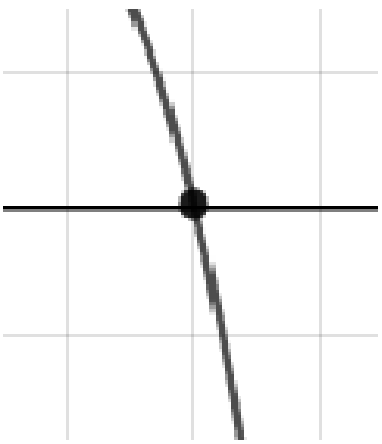
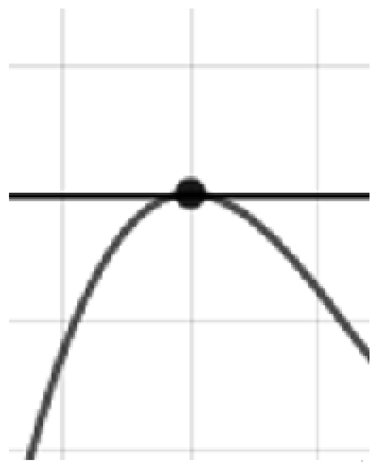
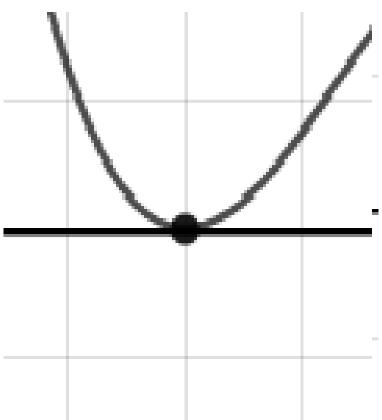
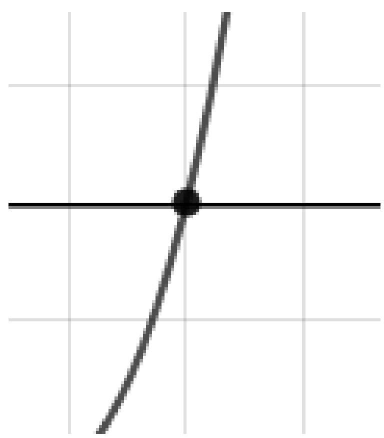
27. Describe the zero behavior of the zero $x = -4$ of the polynomial below.

$$f(x) = 7(x - 7)^{10}(x + 7)^9(x + 4)^{14}(x - 4)^9$$

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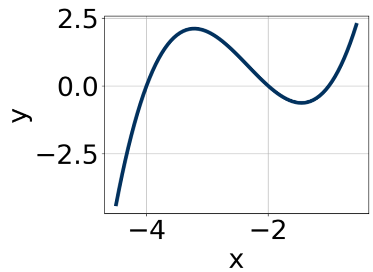
28. Which of the following equations *could* be of the graph presented below?



The solution is $5(x+2)^5(x+4)^9(x+1)^{11}$

A. $9(x+2)^6(x+4)^6(x+1)^7$

The factors -2 and -4 have have been odd power.

B. $-2(x+2)^4(x+4)^9(x+1)^9$

The factor $(x+2)$ should have an odd power and the leading coefficient should be the opposite sign.

C. $-5(x+2)^5(x+4)^9(x+1)^5$

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

D. $15(x+2)^8(x+4)^9(x+1)^7$

The factor -2 should have been an odd power.

E. $5(x+2)^5(x+4)^9(x+1)^{11}$

* This is the correct option.

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

$$\frac{1}{5}, \frac{-3}{5}, \text{ and } \frac{-4}{5}$$

The solution is $125x^3 + 150x^2 + 25x - 12$

A. $a \in [122, 131], b \in [192, 206], c \in [90, 102], \text{ and } d \in [7, 15]$

$125x^3 + 200x^2 + 95x + 12$, which corresponds to multiplying out $(5x+5)(5x-5)(5x-5)$.

B. $a \in [122, 131], b \in [144, 159], c \in [24, 29], \text{ and } d \in [-17, -7]$

* $125x^3 + 150x^2 + 25x - 12$, which is the correct option.

C. $a \in [122, 131], b \in [-154, -145], c \in [24, 29], \text{ and } d \in [7, 15]$

$125x^3 - 150x^2 + 25x + 12$, which corresponds to multiplying out $(5x+1)(5x-3)(5x-4)$.

D. $a \in [122, 131], b \in [144, 159], c \in [24, 29], \text{ and } d \in [7, 15]$

$125x^3 + 150x^2 + 25x + 12$, which corresponds to multiplying everything correctly except the constant term.

E. $a \in [122, 131], b \in [46, 53], c \in [-57, -51],$ and $d \in [-17, -7]$

$125x^3 + 50x^2 - 55x - 12$, which corresponds to multiplying out $(5x + 5)(5x + 5)(5x - 5)$.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(5x - 1)(5x + 3)(5x + 4)$

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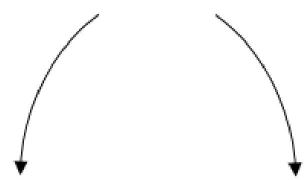
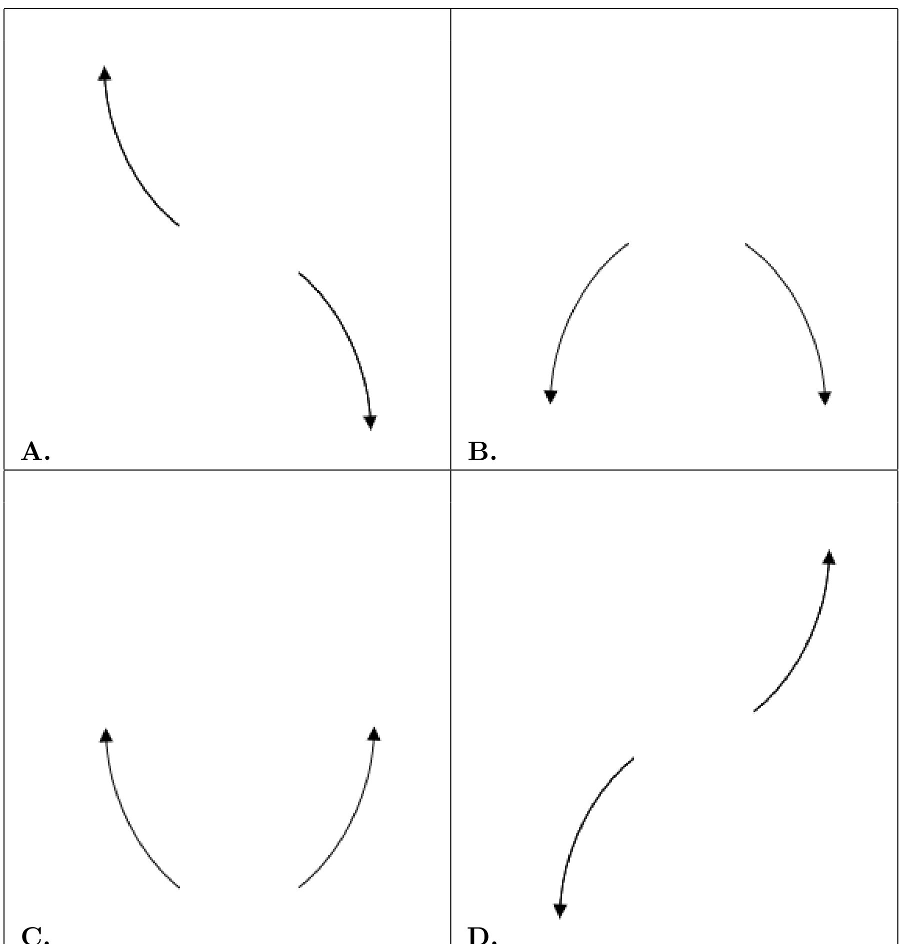
30. Describe the end behavior of the polynomial below.

$$f(x) = -3(x - 6)^3(x + 6)^8(x - 5)^4(x + 5)^5$$

The solution is





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.