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

$$-5 + 2i \text{ and } -3$$

The solution is $x^3 + 13x^2 + 59x + 87$

A. $b \in [-2, 2], c \in [-2, 3],$ and $d \in [-7, -5]$

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

B. $b \in [10, 18], c \in [52, 65],$ and $d \in [82, 88]$

* $x^3 + 13x^2 + 59x + 87$, which is the correct option.

C. $b \in [-18, -10], c \in [52, 65],$ and $d \in [-91, -86]$

$x^3 - 13x^2 + 59x - 87$, which corresponds to multiplying out $(x - (-5 + 2i))(x - (-5 - 2i))(x - 3)$.

D. $b \in [-2, 2], c \in [3, 10],$ and $d \in [7, 18]$

$x^3 + x^2 + 8x + 15$, which corresponds to multiplying out $(x + 5)(x + 3)$.

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 $(x - (-5 + 2i))(x - (-5 - 2i))(x - (-3))$.

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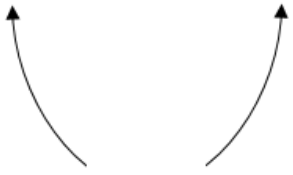
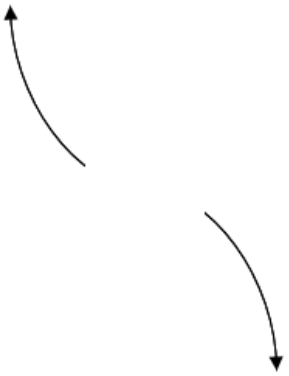
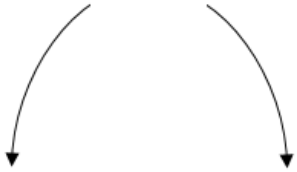
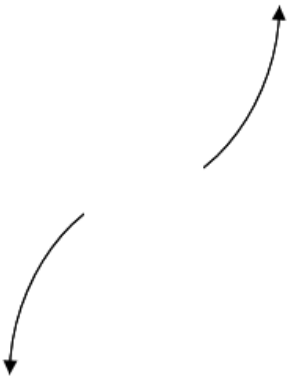
27. Describe the end behavior of the polynomial below.

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

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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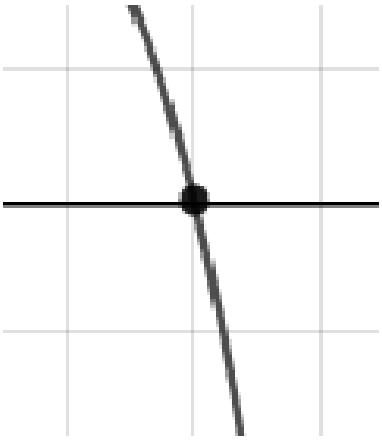
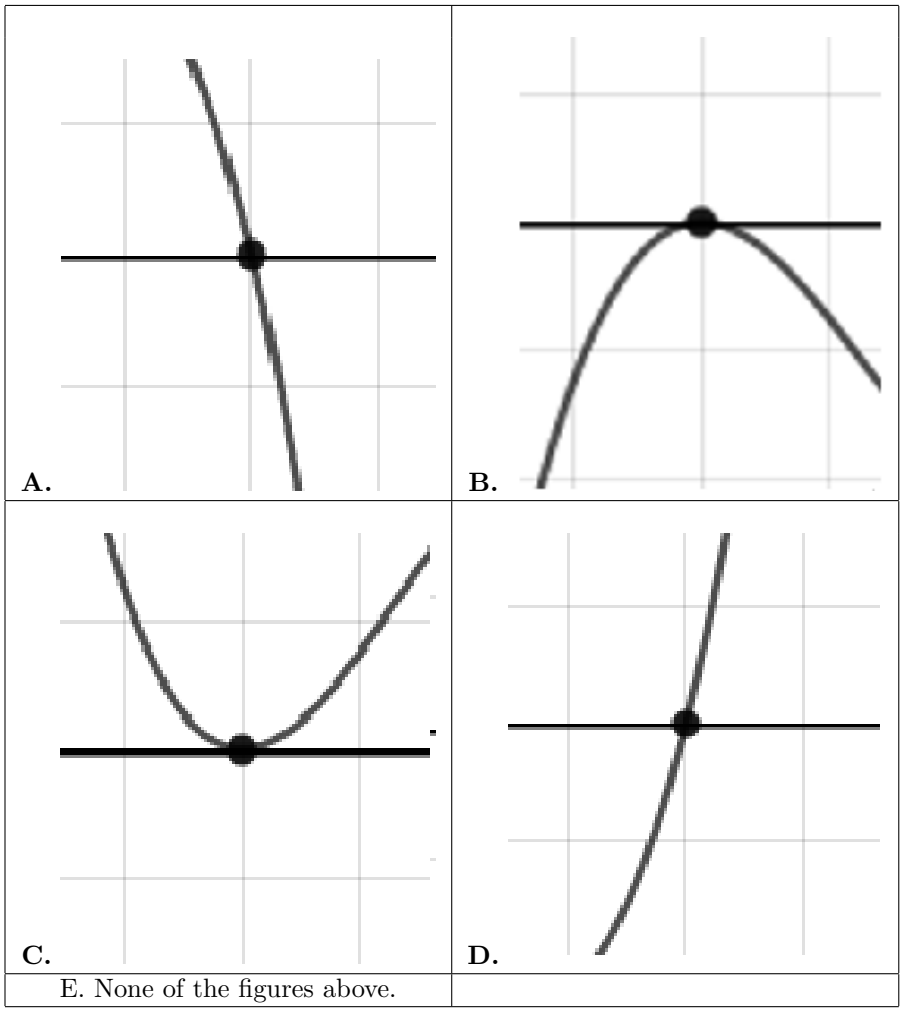
28. Describe the zero behavior of the zero $x = -5$ of the polynomial below.

$$f(x) = -4(x-8)^{10}(x+8)^{7}(x-5)^{12}(x+5)^{9}$$

The solution is





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.

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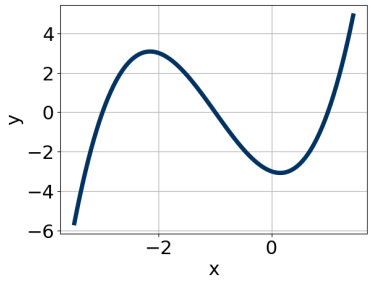
29. Which of the following equations *could* be of the graph presented below?



The solution is $2(x-1)^7(x+1)^9(x+3)^{11}$

A. $2(x-1)^7(x+1)^9(x+3)^{11}$

   * This is the correct option.

B. $4(x-1)^4(x+1)^{10}(x+3)^7$

   The factors 1 and -1 have have been odd power.

C. $-17(x-1)^7(x+1)^9(x+3)^9$

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

D. $10(x-1)^4(x+1)^{11}(x+3)^5$

The factor 1 should have been an odd power.

E. $-7(x-1)^6(x+1)^7(x+3)^{11}$

The factor $(x-1)$ 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).

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

$$\frac{4}{5}, -7, \text{ and } -6$$

The solution is $5x^3 + 61x^2 + 158x - 168$

A. $a \in [-6, 10], b \in [-4, 2], c \in [-216, -208],$ and $d \in [-178, -159]$

$5x^3 - 1x^2 - 214x - 168$, which corresponds to multiplying out $(5x+5)(x+1)(x-1)$.

B. $a \in [-6, 10], b \in [66, 79], c \in [260, 268],$ and $d \in [167, 174]$

$5x^3 + 69x^2 + 262x + 168$, which corresponds to multiplying out $(5x+5)(x-1)(x-1)$.

C. $a \in [-6, 10], b \in [57, 66], c \in [147, 159],$ and $d \in [167, 174]$

$5x^3 + 61x^2 + 158x + 168$, which corresponds to multiplying everything correctly except the constant term.

D. $a \in [-6, 10], b \in [-64, -59], c \in [147, 159],$ and $d \in [167, 174]$

$5x^3 - 61x^2 + 158x + 168$, which corresponds to multiplying out $(5x+4)(x-7)(x-6)$.

E. $a \in [-6, 10], b \in [57, 66], c \in [147, 159],$ and $d \in [-178, -159]$

* $5x^3 + 61x^2 + 158x - 168$, which is the correct option.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(5x-4)(x+7)(x+6)$
