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

$$\frac{4}{5}, \frac{-7}{4}, \text{ and } \frac{5}{3}$$

The solution is $60x^3 - 43x^2 - 179x + 140$

A. $a \in [57, 68], b \in [52, 55], c \in [-173, -166],$ and $d \in [-143, -138]$

$60x^3 + 53x^2 - 171x - 140$, which corresponds to multiplying out $(5x + 5)(4x - 4)(3x - 3)$.

B. $a \in [57, 68], b \in [42, 47], c \in [-186, -177],$ and $d \in [-143, -138]$

$60x^3 + 43x^2 - 179x - 140$, which corresponds to multiplying out $(5x + 4)(4x - 7)(3x + 5)$.

C. $a \in [57, 68], b \in [-48, -38], c \in [-186, -177],$ and $d \in [137, 145]$

* $60x^3 - 43x^2 - 179x + 140$, which is the correct option.

D. $a \in [57, 68], b \in [-48, -38], c \in [-186, -177],$ and $d \in [-143, -138]$

$60x^3 - 43x^2 - 179x - 140$, which corresponds to multiplying everything correctly except the constant term.

E. $a \in [57, 68], b \in [-165, -155], c \in [8, 12],$ and $d \in [137, 145]$

$60x^3 - 157x^2 + 11x + 140$, which corresponds to multiplying out $(5x + 5)(4x + 4)(3x - 3)$.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(5x - 4)(4x + 7)(3x - 5)$

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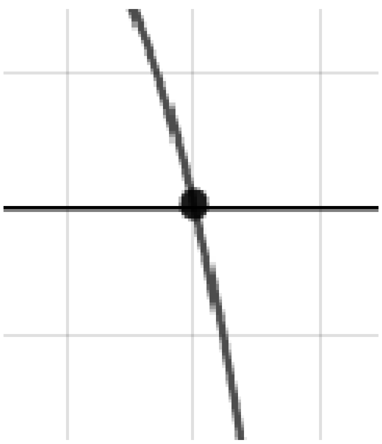
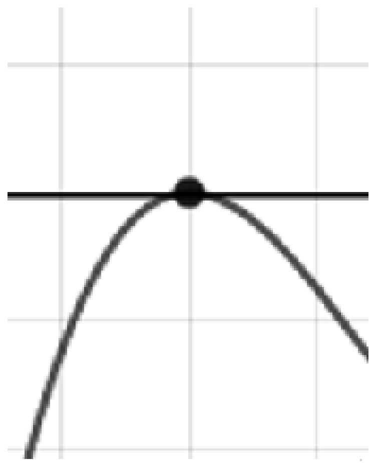
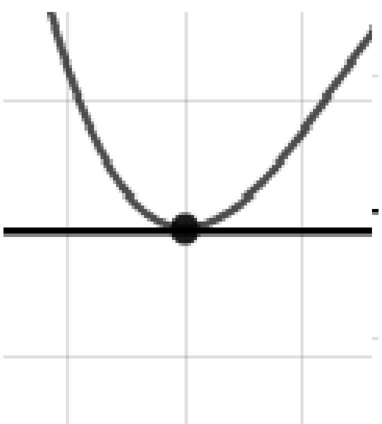
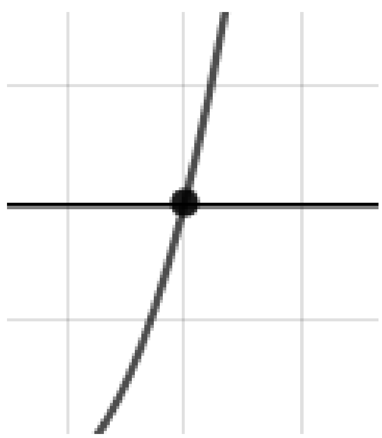
27. Describe the zero behavior of the zero $x = 5$ of the polynomial below.

$$f(x) = 2(x + 6)^{11}(x - 6)^8(x + 5)^9(x - 5)^8$$

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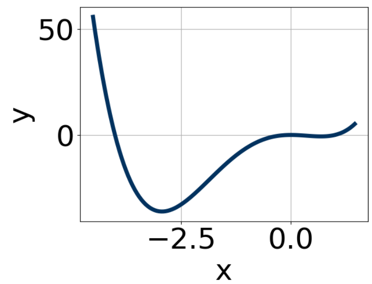
28. Which of the following equations *could* be of the graph presented below?



The solution is $19x^8(x-1)^7(x+4)^5$

A. $19x^8(x-1)^7(x+4)^5$

   * This is the correct option.

B. $-18x^{10}(x-1)^9(x+4)^{11}$

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

C. $19x^{10}(x-1)^4(x+4)^7$

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

D. $-15x^6(x-1)^9(x+4)^4$

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

E. $17x^7(x-1)^6(x+4)^7$

   The factor 0 should have an even power and the factor 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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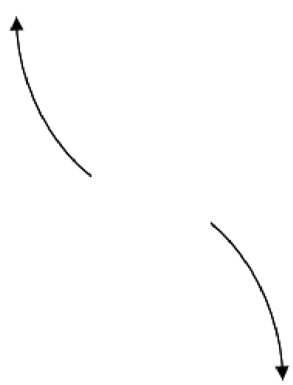
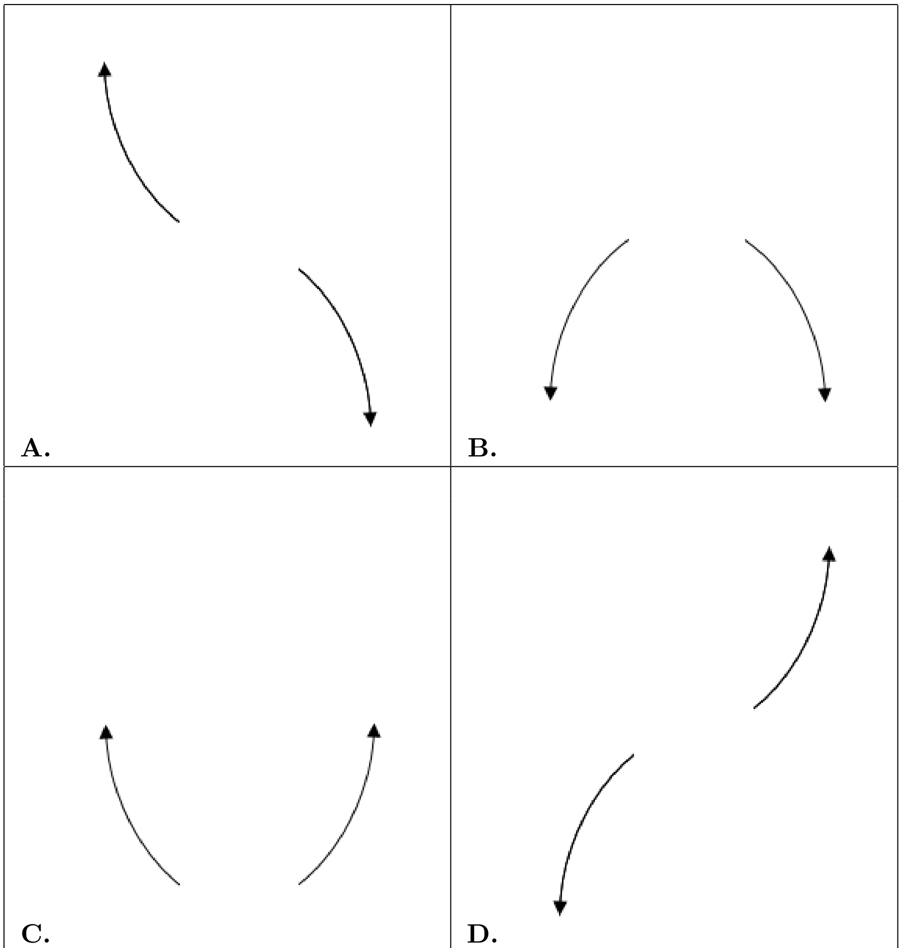
29. Describe the end behavior of the polynomial below.

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

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.

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

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

The solution is $x^3 - 2x^2 + x + 100$

A. $b \in [0.9, 1.29], c \in [0.57, 2.03],$ and $d \in [-15, -9]$

$x^3 + x^2 + x - 12$, which corresponds to multiplying out $(x - 3)(x + 4)$.

B. $b \in [0.9, 1.29], c \in [-0.81, 0.51],$ and $d \in [-23, -14]$

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

C. $b \in [-2.11, -1.02], c \in [0.57, 2.03]$, and $d \in [98, 102]$

   * $x^3 - 2x^2 + x + 100$, which is the correct option.

D. $b \in [1.03, 2.65], c \in [0.57, 2.03]$, and $d \in [-101, -98]$

   $x^3 + 2x^2 + x - 100$, which corresponds to multiplying out $(x - (3 + 4i))(x - (3 - 4i))(x - 4)$.

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