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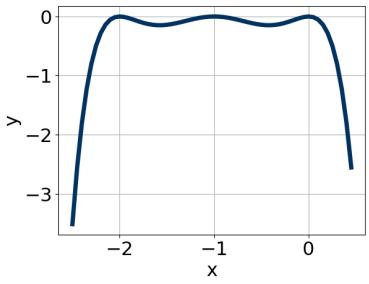
26. Which of the following equations *could* be of the graph presented below?



The solution is $-2x^8(x+1)^8(x+2)^4$

A. $-18x^{10}(x+1)^9(x+2)^5$

The factors $(x+1)$ and $(x+2)$ should both have even powers.

B. $-8x^6(x+1)^{10}(x+2)^{11}$

The factor $(x+2)$ should have an even power.

C. $-2x^8(x+1)^8(x+2)^4$

* This is the correct option.

D. $6x^4(x+1)^{10}(x+2)^9$

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

E. $14x^4(x+1)^8(x+2)^4$

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

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

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

The solution is $x^3 + 11x^2 + 44x + 60$

A. $b \in [0, 6], c \in [-3, 5],$ and $d \in [-10, -3]$

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

B. $b \in [0, 6], c \in [5, 12],$ and $d \in [9, 14]$

$x^3 + x^2 + 7x + 12$, which corresponds to multiplying out $(x+4)(x+3)$.

C. $b \in [5, 12], c \in [43, 55],$ and $d \in [51, 63]$

   * $x^3 + 11x^2 + 44x + 60$, which is the correct option.

D. $b \in [-16, -9], c \in [43, 55],$ and $d \in [-67, -56]$

   $x^3 - 11x^2 + 44x - 60$, which corresponds to multiplying out $(x - (-4 + 2i))(x - (-4 - 2i))(x - 3)$.

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

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

$$\frac{1}{4}, -5, \text{ and } 7$$

The solution is $4x^3 - 9x^2 - 138x + 35$

A. $a \in [0, 7], b \in [-47.7, -42], c \in [120, 137],$ and $d \in [31, 41]$

   $4x^3 - 47x^2 + 128x + 35$, which corresponds to multiplying out $(4x + 4)(x + 1)(x - 1)$.

B. $a \in [0, 7], b \in [-12.1, -7.8], c \in [-139, -134],$ and $d \in [-43, -30]$

   $4x^3 - 9x^2 - 138x - 35$, which corresponds to multiplying everything correctly except the constant term.

C. $a \in [0, 7], b \in [-12.1, -7.8], c \in [-139, -134],$ and $d \in [31, 41]$

   * $4x^3 - 9x^2 - 138x + 35$, which is the correct option.

D. $a \in [0, 7], b \in [-8.9, -6.8], c \in [-149, -141],$ and $d \in [-43, -30]$

   $4x^3 - 7x^2 - 142x - 35$, which corresponds to multiplying out $(4x + 4)(x - 1)(x - 1)$.

E. $a \in [0, 7], b \in [8.2, 12.2], c \in [-139, -134],$ and $d \in [-43, -30]$

   $4x^3 + 9x^2 - 138x - 35$, which corresponds to multiplying out $(4x + 1)(x - 5)(x + 7)$.

General Comments: To construct the lowest-degree polynomial, you want to multiply out $(4x-1)(x+5)(x-7)$

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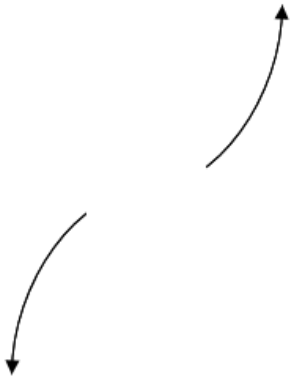
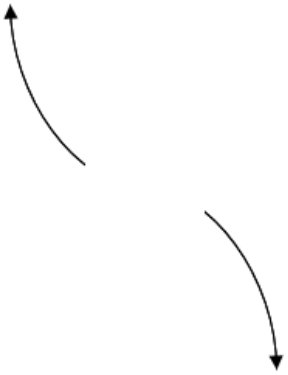
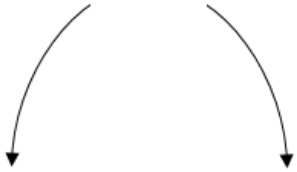
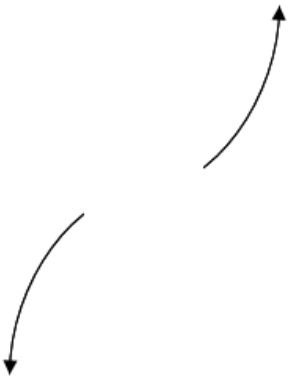
29. Describe the end behavior of the polynomial below.

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

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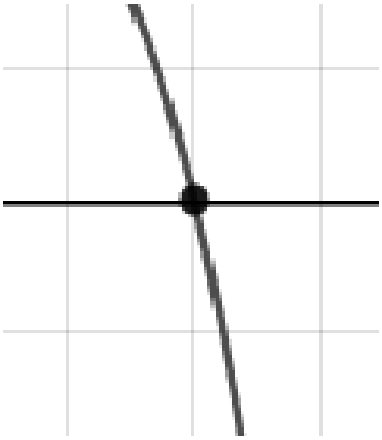
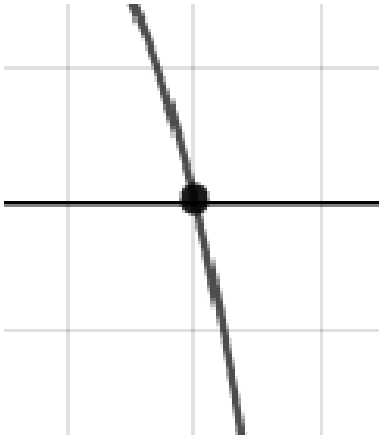
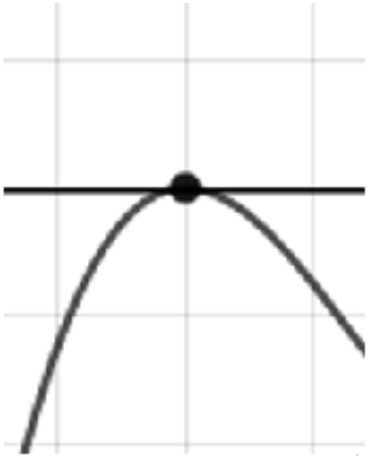
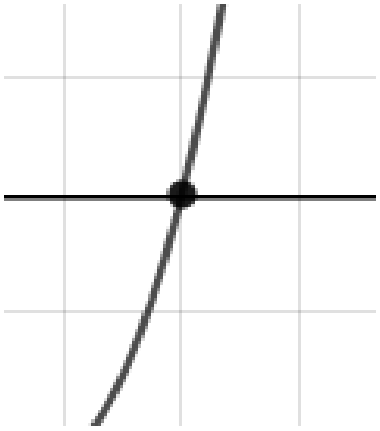
30. Describe the zero behavior of the zero $x = -4$ of the polynomial below.

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

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.