

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.*

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

$$4 - 5i \text{ and } 1$$

The solution is  $x^3 - 9x^2 + 49x - 41$

A.  $b \in [5, 18], c \in [42, 60]$ , and  $d \in [39, 50]$

$x^3 + 9x^2 + 49x + 41$ , which corresponds to multiplying out  $(x - (4 - 5i))(x - (4 + 5i))(x + 1)$ .

B.  $b \in [-4, 6], c \in [-3, 7]$ , and  $d \in [-11, 1]$

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

C.  $b \in [-12, 0], c \in [42, 60]$ , and  $d \in [-50, -33]$

\*  $x^3 - 9x^2 + 49x - 41$ , which is the correct option.

D.  $b \in [-4, 6], c \in [-9, 0]$ , and  $d \in [3, 5]$

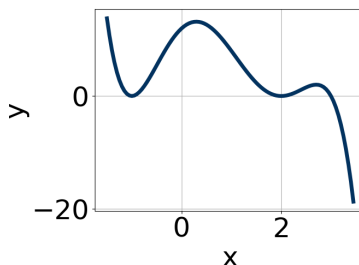
$x^3 + x^2 - 5x + 4$ , which corresponds to multiplying out  $(x - 4)(x - 1)$ .

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  $(x - (4 - 5i))(x - (4 + 5i))(x - (1))$ .

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



The solution is  $-12(x + 1)^6(x - 2)^6(x - 3)^{11}$

A.  $-8(x + 1)^6(x - 2)^5(x - 3)^9$

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

B.  $-18(x+1)^8(x-2)^5(x-3)^6$

The factor  $(x-2)$  should have an even power and the factor  $(x-3)$  should have an odd power.

C.  $4(x+1)^6(x-2)^{10}(x-3)^8$

The factor  $(x-3)$  should have an odd power and the leading coefficient should be the opposite sign.

D.  $18(x+1)^4(x-2)^{10}(x-3)^{11}$

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

E.  $-12(x+1)^6(x-2)^6(x-3)^{11}$

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

$$\frac{-6}{5}, 3, \text{ and } \frac{7}{5}$$

The solution is  $25x^3 - 80x^2 - 27x + 126$

A.  $a \in [19, 30], b \in [-150, -138], c \in [231, 241], \text{ and } d \in [-130, -122]$

$25x^3 - 140x^2 + 237x - 126$ , which corresponds to multiplying out  $(5x+5)(x-1)(5x-5)$ .

B.  $a \in [19, 30], b \in [-90, -74], c \in [-32, -21], \text{ and } d \in [123, 132]$

\*  $25x^3 - 80x^2 - 27x + 126$ , which is the correct option.

C.  $a \in [19, 30], b \in [73, 86], c \in [-32, -21], \text{ and } d \in [-130, -122]$

$25x^3 + 80x^2 - 27x - 126$ , which corresponds to multiplying out  $(5x-6)(x+3)(5x+7)$ .

D.  $a \in [19, 30], b \in [-90, -74], c \in [-32, -21], \text{ and } d \in [-130, -122]$

$25x^3 - 80x^2 - 27x - 126$ , which corresponds to multiplying everything correctly except the constant term.

E.  $a \in [19, 30], b \in [5, 11], c \in [-159, -150], \text{ and } d \in [123, 132]$

$25x^3 + 10x^2 - 153x + 126$ , which corresponds to multiplying out  $(5x+5)(x+1)(5x-5)$ .

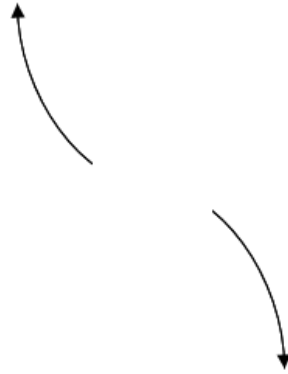
General Comments: To construct the lowest-degree polynomial, you want to multiply out  $(5x+6)(x-3)(5x-7)$

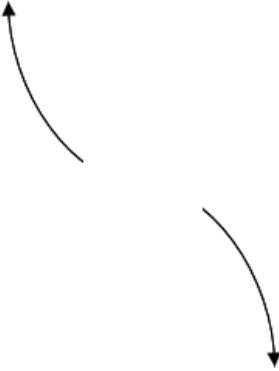
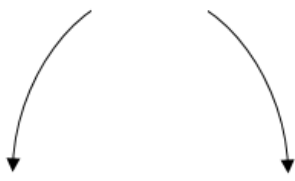
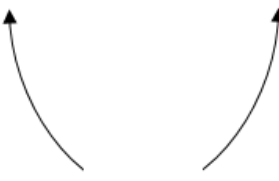
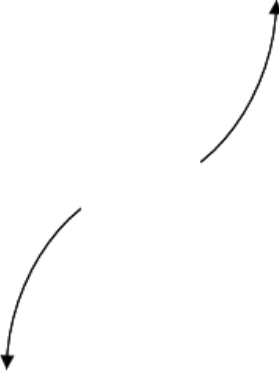
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29. Describe the end behavior of the polynomial below.

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

The solution is



 <p>A.</p>	 <p>B.</p>
 <p>C.</p>	 <p>D.</p>
<p>E. None of the figures above.</p>	

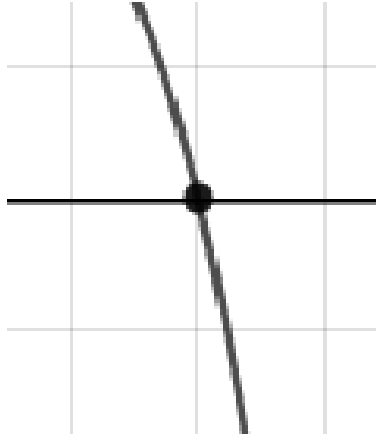
- A. The function is above the  $x$ -axis, then passes through.
- B. The function is below the  $x$ -axis, then touches.
- C. The function is above the  $x$ -axis, then touches.
- D. The function is below the  $x$ -axis, then passes through.

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

30. Describe the zero behavior of the zero  $x = 2$  of the polynomial below.

$$f(x) = -6(x + 4)^{10}(x - 4)^8(x - 2)^{11}(x + 2)^6$$

The solution is



<p>A.</p>	<p>B.</p>
<p>C.</p>	<p>D.</p>
<p>E. None of the figures above.</p>	

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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