

## Algebra Essentials and Applications Internet Activity

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### ME1 Zeros Investigations

1. If we cube a positive number—that is, raise the positive number to the third power—is the result positive or negative? If we cube a positive number, is the result greater than or less than the original number? What happens to the values of  $x^3$  as  $x$  increases?

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2. If we cube a negative number—raise the negative number to the third power—is the result positive or negative? If we cube a negative number that is large in magnitude (that is, far to the left on the number line), is the result larger or smaller in magnitude than the original number? What happens to the values of  $x^3$  as  $x$  decreases?

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You have seen that, as the values of  $x$  move to the right, the values of  $y = x^3$  become larger. In other words, the graph moves off the top of the page (or screen).

Likewise, as the values of  $x$  move to the left, the values of  $y = x^3$  decrease. In other words, the graph moves off the bottom of the page (or screen).

We will refer to what happens to the graph as  $x$  gets larger or smaller as the *end behavior* of the graph. In the example above, we say the end behavior is DOWN—UP, since the left end of the graph points downward and the right end of the graph points upward.

Now, using the “Graphing Cubic Polynomials” site, set  $a = -1$  and leave the other values as zero. Click on “Redraw.”

3. How does this graph compare to the previous graph?

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4. How would you describe the end behavior?

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5. Where does the graph cross the  $x$ -axis? Was this the same in the previous graph?

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Next, graph  $y = x^3 + 1$  by changing the numbers to  $a = 1$ ,  $b = 0$ ,  $c = 0$ , and  $d = 1$ .

6. How would you describe the end behavior?

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7. Where does the graph cross the  $x$ -axis?

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Graph  $y = x - x^3$  by changing the numbers to  $a = -1$ ,  $b = 0$ ,  $c = 1$ , and  $d = 0$ .

8. How does this graph compare to the previous graph? Explain why in mathematical terms if you can.

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9. How would you describe the end behavior?

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10. Where does the graph cross the  $x$ -axis? Is this the same as before?

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Finally, graph  $y = x^3 - 4x^2 + 2x + 1$  by changing the numbers to  $a = 1$ ,  $b = -4$ ,  $c = 2$ , and  $d = 1$ .

11. How would you describe the end behavior?

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