Multiplicity of Zeros of Functions
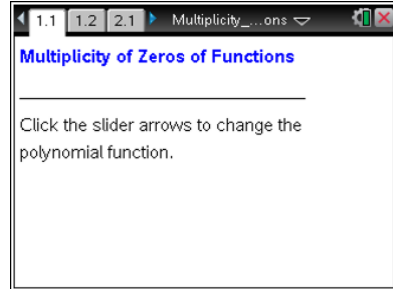## Student Activity

Name _____

Class _____

Open the TI-Nspire document *Multiplicity_of_Zeros_of_ Functions.tns*.

In this activity, you will explore the equations of polynomial functions in both factored and standard form. You will discover the characteristics of the zeros of polynomial functions and the multiplicity of the zeros.

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Press [ctrl] ▶ and [ctrl] ◀ to navigate through the lesson.

1. Click the slider until it reads **#1**.
    a. What are the zeros of the function?

    b. For what value(s) of *x* does the graph of the function cross the x-axis?

    c. For what value(s) of *x* does the graph of the function touch but not cross the x-axis?

    d. What degree is the polynomial?

2. Click the slider again for functions **#2**–**#5**. For each function, answer the questions asked in Question 1. Use the table below to record your results.

#	Function	Zeros	Cross	Touch	Degree
2					
3					
4					
5					

3. How are the zeros of a polynomial function related to the factors of a polynomial function?

4. How do the exponents in each term in the factored form of the polynomial function affect its graph?

5. Revisit graphs **#1**–**#5,** and observe the end behavior for the polynomial functions. What does the degree of the polynomial function tell you about its end behavior?

6. When a polynomial has a repeated linear factor, it has a multiple zero. Write the factored form of a polynomial function that crosses the x-axis at $x = –2$ and $x = 5$ and touches the x-axis at $x = 3$. Which of the zeros of the function must have a multiplicity greater than 1? Explain your reasoning.

7. Write two additional polynomial functions that meet the same conditions as described in Question 6. Explain what is different from your function in Question 6, and how you determined your polynomial functions.

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8. Click the slider until it reads **#1**.
    a. Write the factored form of the polynomial function graphed.

    b. Describe how you determined the factors of the polynomial function.

9. Click the slider until it reads **#2**.
    a. Write the factored form of the polynomial function graphed.

    b. Describe how you determined the degree of each of the factors of the polynomial function.

10. Click the slider until it reads **#3**.
    a. Write the factored form of the polynomial function graphed.

    b. Verify your answer by expanding the polynomial and comparing to the standard form given.

11. For what reasons would you use the factored form of a polynomial equation? The standard form?