

The Limit of a function at a point

The graph of $f(x) = \frac{\sqrt[3]{x+3} - 2}{x-5}$ has a hole. Your task is to determine the location of this hole using approximation techniques (no fancy limit computations allowed).

Preparation Instructions: Answer the following questions *individually* and bring your write-up to class.

A. Draw a graph of f using an entire sheet of paper. Your graph should be drawn at a scale that gives a good sense of the x,y -coordinates of the hole. The x and y scales should be chosen so that your graph nearly extends between two diagonally opposite corners of the page.

B. Identify what **unknown numerical value** you will need to approximate. Give it an appropriate shorthand name (that is, a variable name).

C. Describe what you will use for **approximations**. Write a description of your answer using algebraic notation (for example, function notation, variables, formulas, etc.)

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Class Instructions: Work with your group on the problem assigned to you. We encourage you to collaborate both in and out of class, but you must write up your responses *individually*.

1. Find an approximation to the height of the hole in your function (write out the approximation with several decimal places). Is this an **underestimate** or **overestimate**? Explain how you know. Find both an underestimate and an overestimate.

2. Redraw your graph at a good scale to clearly illustrate how you can approximate the height of the hole. Label the unknown height and the approximation.

6. Find an approximation with error smaller than 1×10^{-5} . Then describe as best as you can *all* of the x -values you could use to get approximations that would have an error smaller than this error bound.

7. For any pre-determined error bound, can you find an approximation with error smaller than that bound? Explain in detail how you know.