

Write a complete C++ program, including comments, to do the following: Your program will compute the values of a formula that expresses  $y$  in terms of  $x$ . The formula is:

$$y = \frac{9x^3 - 27x^2 - 4x + 12}{(3x^2 + 1)^{1/2} + |5 - x^4|}$$

where  $|\dots|$  means "absolute value of" and  $(\dots)^{1/2}$  means "square root of". (Use the built-in functions for these operations.)

1. The program should start by printing a message saying this is the output of your first program.
2. Then, it should evaluate the formula starting with  $x = -3$ , going up by 0.5 each time, until  $x$  reaches 4. Therefore, it will use values  $x$ : -3, -2.5, ..., -0.5, 0, 0.5, ..., 3.5, 4. For each value of  $x$ , the program should compute the corresponding value of  $y$ . It should print these values together with explanations of what the values represent. For example, it could print the string 'X = ', then the value of  $x$ , then the string 'Y = ', then the value of  $y$ , and then a message. (It is also possible to use column headings instead if you desire.) The message should say one of three things:
  - a) If the value of  $y$  is exactly 0, the message should say 'Y IS ZERO'.
  - b) If the value of  $y$  is positive, the message should say 'Y IS POSITIVE'.
  - c) If the value of  $y$  is negative, the message should say 'Y IS NEGATIVE'.

A typical line of output would then be:

X = -2.5	Y = 1.23456	Y IS POSITIVE
(in actuality, this may not be the value for $y$ ).		

3. Once you have finished using  $x = 4$ , the program should print a message (underneath the last line of output) stating that the program is halting. Then, stop.

### Optional:

1. Have your program find which of the  $y$  values is closest to 10 (either larger or smaller). have the program print the  $x$  value that gives this closest  $y$  value. Also, print how close the  $y$  value is to 10.
2. Have your program count how many times the formula yields positive, negative, and zero results. Print these three values.
3. Use a table, with appropriate column headings, to display the output.