



Graph the function $y = 2x^3 - 5x - 3$ by pressing [Y=] and entering it next to Y1. Press [ZOOM] and select **ZStandard**.

Use the **ZBox** command to take a closer look at the zeros.

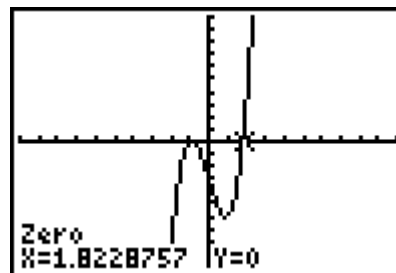
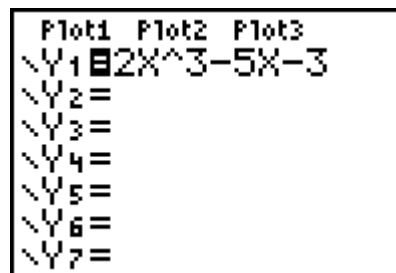
Calculate the zero appearing to pass through the point (2, 0) by pressing [2nd] [Calc] and selecting **zero**.

Now, use the arrow keys to move the cursor to

- the left of the zero and press [ENTER]
- the right of the zero and press [ENTER]
- the guess of the zero's location and press [ENTER]

Repeat this procedure for the other zero appearing on the graph. Record your calculated zeros in the table below.

Use the graphing procedure to find the zeros for the other two functions listed in the table below.



Function	Zeros
$Y_1 = 2x^3 - 5x - 3$	
$Y_2 = 6x^3 - 25x^2 + 21x + 10$	
$Y_3 = 3x^4 - 11x^3 - 3x^2 - 6x + 8$	

What do the graphs have in common?

Repeat the procedure of graphically finding the zeros for the functions below.

Function	Zeros
$Y_4 = 2x^3 - 5x^2 - x + 8$	
$Y_5 = x^3 + 3x - 3$	
$Y_6 = 4x^4 + 9x^3 - 9x^2 - 15$	

What do the graphs have in common?



It's A Rat Race For The Zeros

Run the program **RATRACE** by pressing **[PRGM]** and selecting it.

- Enter the number 10. Press **[STAT]** **[ENTER]** to see the entire list. What does the output describe?

```
NUMBER?10
```

Enter the leading coefficient (2) and constant term (3) from the first function of this activity, $y = 2x^3 - 5x - 3$.

- Can any combination of the values in these two sets produce a zero of the function? If so, what is the zero?

To test if a value results in a zero, press **[VARS]**, arrow to the Y-VARS menu and select **Y1**. Enter the value as shown at the right.

```
Y1(2)
```

- Use the program to work through the other two equations in the first table entering the leading coefficient and the constant term. Try to find a general formula for determining a zero.
- Now use the program to work through the equations in the second table. Can any combination of the values in these two factor-sets produce a zero of the function? If so, what is the zero?
- When does the function have a zero but the sets do not produce one?