Consider the equation $y = x^2 + x - 15$. Press [Y=] and enter the equation as shown.

```
NORMAL FLOAT AUTO REAL DEGREE MP

 Plot1  Plot2  Plot3
..................................................
■\Y₁■2X²+X−15

..................................................
■\Y₂=
■\Y₃=
■\Y₄=
■\Y₅=
■\Y₆=
■\Y₇=
```
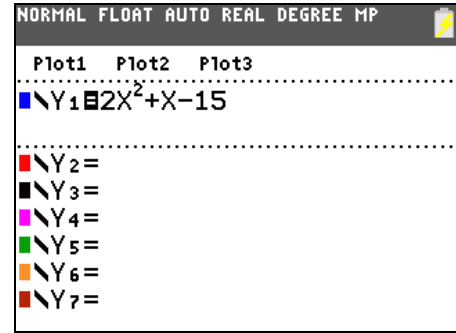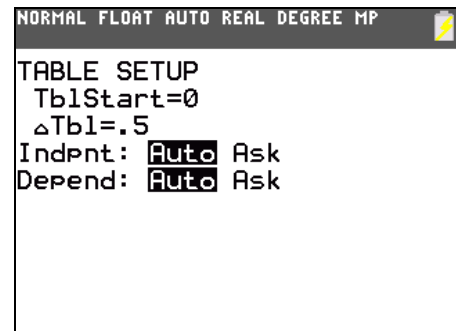
Press [GRAPH]. Take a moment to examine the graph. It would be helpful to be able to see the vertex. Press [WINDOW] and adjust the window to show more space below the *x*-axis. Press [GRAPH].

```
NORMAL FLOAT AUTO REAL DEGREE MP

WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-20
 Ymax=20
 Yscl=1
 Xres=1
 ΔX=.07575757575757
 TraceStep=.15151515151515
```
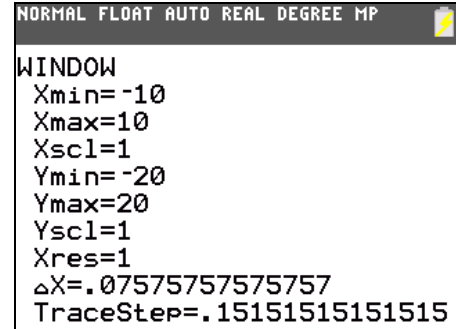
- Approximately where is the vertex of the parabola?

- What do you notice about the shape of the parabola?

The symmetry of a parabola should mean that for every value of *y* that the parabola takes on, there are two values of *x* that are paired with it. Press [2nd] [TABLE]. Examine the table and notice that there are no repeated values of *y*. Try adjusting the table set up to view more values of *x*. Press [2nd] [TBLSET] and set the "change in table" to 0.5 as shown here.

```
NORMAL FLOAT AUTO REAL DEGREE MP

TABLE SETUP
 TblStart=0
 ΔTbl=.5
Indpnt: Auto Ask
Depend: Auto Ask
```

Press [2nd] [TABLE]. Now, as expected, each *y* value is associated with two *x* values. Choose a pair of *x*-values that have the same *y*-value.

Press [2nd] [QUIT] to go to the Home screen. Average the two *x*-values by adding them together and then dividing the sum by 2.

```
NORMAL FLOAT AUTO REAL DEGREE MP
PRESS + FOR ΔTbl
   X      Y₁
 -.5     -15
  0      -15
  .5     -14
  1      -12
  1.5    -9
  2      -5
  2.5     0
  3       6
  3.5    13
  4      21
  4.5    30

X=-.5
```

Return to the table. Choose another pair of *x*-values that have the same *y*-value.

Press 2nd [QUIT] to go to the Home screen. Average the two *x*-values.

- What do you notice about the two averages so far?

- What significance might this number have?

- Using either factoring or the quadratic formula you should (or will) be able to find two *x*-values that have the *y*-value of zero for many parabolas.

Choose the two *x*-values that represent the zeros of this parabola using the table or another method.

Return to the home screen. Average the two *x*-values.

- What do you notice about these three averages? What significance might this number have?

Think about what it means to average two numbers on a number line. The average is the point ***halfway*** in between the numbers.

- If you fold the parabola and match up the symmetrical parts, what would be the point on the fold, or halfway in between?

To see what the significance of the value *x* = –0.25, examine the graph. Press GRAPH. Press TRACE. In "trace" mode, type (-) . 2 5. Press ENTER.

- What point on the parabola have you found?