

Sharp EL-9900 Graphing Calculator

Basic Keyboard Activities

General Mathematics

Algebra

Programming

Advanced Keyboard Activities

Algebra

Calculus

Statistics

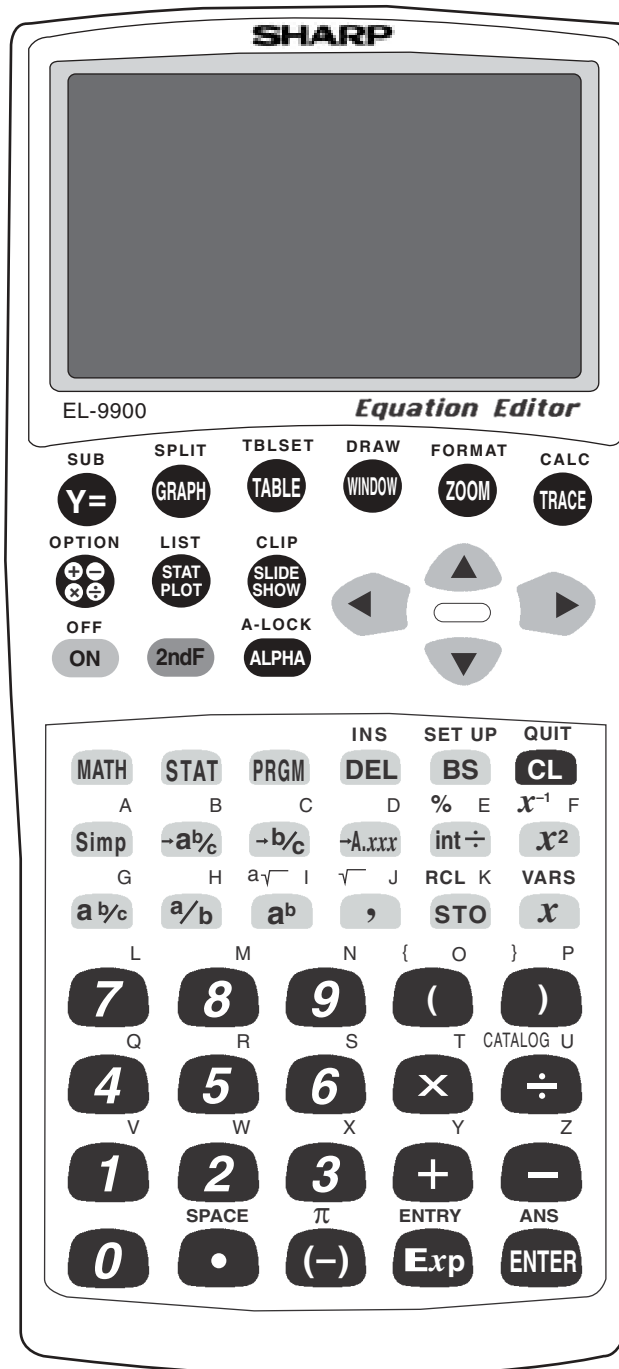
Trigonometry

Programming

Sharp EL-9900

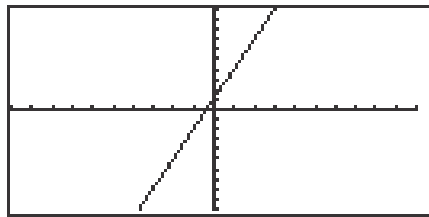
Graphing Calculator

Basic Keypad



GRAPHING LINEAR EQUATIONS

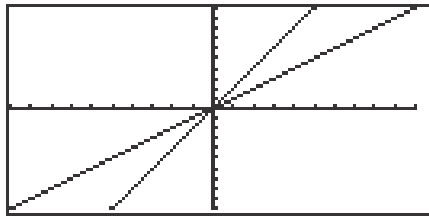
1. Turn the calculator on and press $\boxed{Y=}$.
2. Press \boxed{CL} to remove an old Y1 expression.
3. Enter the linear equation ($y = 3x + 1$) for Y1 by pressing $\boxed{3}$ \boxed{x} $\boxed{+}$ $\boxed{1}$.
4. Enter the viewing window range by pressing \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**). This establishes the default viewing ranges for graphing equations. These ranges are $-10 < x < 10$ and $-10 < y < 10$.
The scale for the x and y axes are 1.



5. To graph another equation, press $\boxed{Y=}$ \boxed{CL} to access and clear the Y1= prompt.
6. Enter the next equation, and press \boxed{GRAPH} to view the graph.
7. If the line does not appear in the default viewing window, press \boxed{ZOOM} $\boxed{4}$ (**OUT**) to enlarge the viewing window.

CHARACTERISTICS OF SLOPE

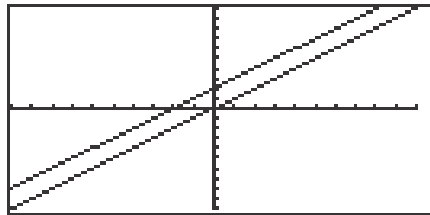
1. Graph the equation $y = 1x$ by pressing $\boxed{Y=}$ \boxed{CL} to remove an old Y1 expression, and press \boxed{x} to enter the equation.
2. Press \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**) to view the graph.
3. Changing the slope to 2 will result in the equation $y = 2x$. Enter this equation for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ $\boxed{2}$ \boxed{x} .
4. To view both the graphs on the same coordinate axes, press \boxed{GRAPH} .
The graph $y = 2x$ has a greater slope than $y = x$.



5. Changing the slope to $\frac{1}{2}$ will result in the equation $y = \frac{1}{2}x$. Enter this equation for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{CL} $\boxed{1}$ $\boxed{a/b}$ $\boxed{2}$ $\boxed{\blacktriangleright}$ \boxed{x} .
6. To view both the graphs on the same coordinate axes, press \boxed{GRAPH} .
The graph $y = \frac{1}{2}x$ has less slope than $y = x$.
7. Changing the slope to -1 will result in the equation $y = -x$. Enter this equation for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{CL} $\boxed{(-)}$ \boxed{x} .
8. To view both the graphs on the same coordinate axes, press \boxed{GRAPH} .
The graph $y = -x$ has the opposite slope of $y = x$.

CHARACTERISTICS OF THE y-INTERCEPT

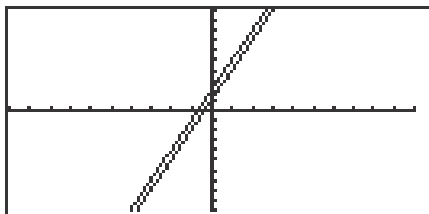
1. Graph the equation $y = x$ by pressing $\boxed{Y=}$ \boxed{CL} to remove an old Y1 expression, and press \boxed{x} to enter the equation.
2. Press \boxed{ENTER} \boxed{CL} to clear Y2 or additional prompts.
3. Use the default viewing range, and press \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**) to view the graph.
4. Adding 2 will result in the equation $y = x + 2$. Enter this equation for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{x} $\boxed{+}$ $\boxed{2}$.
5. To view both the graphs on the same coordinate axes, press \boxed{GRAPH} . The graph $y = x + 2$ has shifted up from the graph of $y = x$. The y-intercept is now $y = 2$.



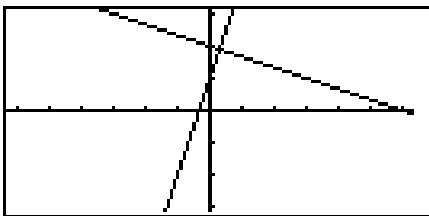
6. Subtracting 2 will result in the equation $y = x - 2$. Enter this equation for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{CL} \boxed{x} $\boxed{-}$ $\boxed{2}$.
7. To view both the graphs on the same coordinate axes, press \boxed{GRAPH} . The graph $y = x - 2$ has shifted down from the graph of $y = x$. The y-intercept is now $y = -2$.

PARALLEL AND PERPENDICULAR LINES

1. Enter the equations $Y_1 = 3X + 1$ and $Y_2 = 3X + 2$ by pressing $\boxed{Y=}$ \boxed{CL} $\boxed{3}$ \boxed{x} $\boxed{+}$ $\boxed{1}$ \boxed{ENTER} \boxed{CL} $\boxed{3}$ \boxed{x} $\boxed{+}$ $\boxed{2}$.
2. Press \boxed{ZOOM} \boxed{A} **(ZOOM)** $\boxed{5}$ **(Default)** to view the graphs.



3. These lines are called parallel since they have an equal slope but different y-intercepts. These lines will not intersect.
4. Enter the equations $Y_1 = 3X - 1$ and $Y_2 = -1/3 X + 1$ by pressing $\boxed{Y=}$ \boxed{CL} $\boxed{3}$ \boxed{x} $\boxed{-}$ $\boxed{1}$ \boxed{ENTER} \boxed{CL} $\boxed{(-)}$ $\boxed{1}$ $\boxed{a/b}$ $\boxed{3}$ $\boxed{\blacktriangleright}$ \boxed{x} $\boxed{+}$ $\boxed{1}$.
5. Press \boxed{ZOOM} \boxed{A} $\boxed{7}$ to view the graphs.

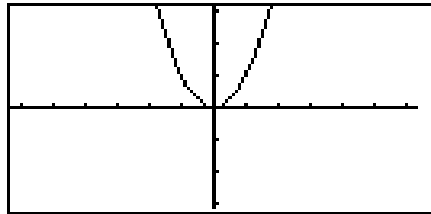


6. These line are called perpendicular since they have slopes that are negative reciprocals of each other ($m_1 = -1/m_2$). Notice, these intersecting lines form four equal angles.
7. Graph two lines with unequal slopes (not negative reciprocals). What do you see? Are the lines parallel, perpendicular or neither?

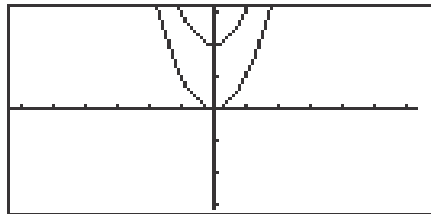
QUADRATIC EQUATIONS

Graphing and translations of quadratic equations

1. Turn the calculator on and press $\boxed{Y=}$. Press \boxed{CL} to remove an old Y1 expression. Press \boxed{ENTER} \boxed{CL} to remove an old Y2 expression.
2. To enter the quadratic equation ($y = x^2$) for Y1, press \boxed{x} $\boxed{x^2}$. Enter the viewing window range by pressing \boxed{ZOOM} \boxed{A} (**Zoom**) $\boxed{7}$ (**Dec**).



3. When 2 is added to x^2 , the resulting equation is $y = x^2 + 2$. Enter this function for Y2 by pressing $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{x} $\boxed{x^2}$ $\boxed{+}$ $\boxed{2}$. Press \boxed{GRAPH} . What does the addition of 2 do?



4. When -2 is added to x^2 , the resulting equation is $y = x^2 - 2$. To change Y2 for this expression, press $\boxed{Y=}$ $\boxed{\nabla}$ \boxed{CL} \boxed{x} $\boxed{x^2}$ $\boxed{-}$ $\boxed{2}$ \boxed{ENTER} \boxed{GRAPH} . What does the addition of -2 do?

EVALUATING A FUNCTION

1. For example, to evaluate $f(x)=x^2-2x+3$ for $x=3$, you will enter the function for Y1 by pressing $\boxed{Y=}$ \boxed{CL} \boxed{x} $\boxed{x^2}$ $\boxed{-}$ $\boxed{2}$ \boxed{x} $\boxed{+}$ $\boxed{3}$. Be sure to clear any other expressions.
2. Press $\boxed{2ndF}$ \boxed{QUIT} \boxed{CL} to return to and clear the calculation screen.
3. To evaluate the function at $x = 3$, first store 3 into the X variable by pressing $\boxed{3}$ \boxed{STO} \boxed{x} \boxed{ENTER} .
4. Evaluate the function stored in Y1 at 3 by pressing $\boxed{2ndF}$ \boxed{VARS} \boxed{A} $\boxed{1}$ \boxed{ENTER} .

$x^2 - 2x + 3$	3
Y1	6

5. Another way to evaluate a function for several values is using the Sharp's table feature. Press \boxed{TABLE} to view a table of values.

X	Y1		
0	3		
1	2		
2	3		
3	6		
4	11		
5	18		
X=0			

6. You can customize the table by pressing $\boxed{2ndF}$ \boxed{TBLSET} . You can set the table's minimum x value (**TBLStrt**) to another value than zero, and you can change the table's increment value (**TBLStep**) from 1 to another value.

OPERATIONS ON FUNCTIONS

1. Press $\boxed{Y=}$ and clear old expressions.
2. Enter the functions for Y1 and Y2. For example, enter $f(x)=2x + 1$ for Y1 and $g(x)=x^2$ for Y2 by moving the cursor to Y1 and pressing $\boxed{2} \boxed{x} \boxed{+} \boxed{1}$, press $\boxed{\nabla}$ to move the cursor to Y2, and press $\boxed{x} \boxed{x^2}$.

```
Y1 $\Rightarrow$ 2X+1
Y2 $\Rightarrow$ X2
Y3=
Y4=
Y5=
Y6=
```

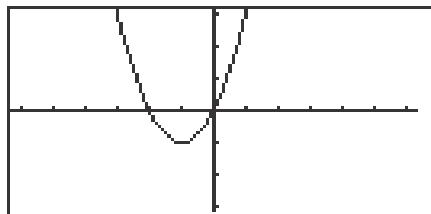
3. Press $\boxed{2ndF} \boxed{QUIT} \boxed{CL}$ to return to and clear the calculation screen.
4. To evaluate $(f+g)(4)$, first store 4 into the X variable by pressing $\boxed{4} \boxed{STO} \boxed{x} \boxed{ENTER}$.
5. Evaluate $(f+g)(4)$ by pressing $\boxed{2ndF} \boxed{VARS} \boxed{A} \boxed{1}$ (Y1) $\boxed{+} \boxed{2ndF} \boxed{VARS} \boxed{2}$ (Y2) \boxed{ENTER} . This can be repeated for $(f-g)(x)$, $(fg)(x)$, and $(f/g)(x)$.

```
4 $\Rightarrow$ X
Y1+Y2
4
25
```

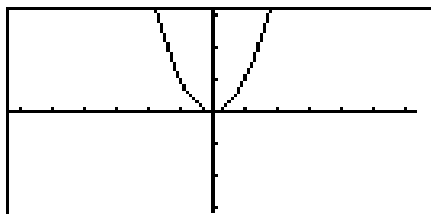
6. Another way to conduct an operation on functions and evaluate it for a value is to use Y3. Press $\boxed{Y=}$ and enter the operation $(f-g)(x)$ into Y3 by pressing $\boxed{2ndF} \boxed{VARS} \boxed{1}$ (Y1) $\boxed{-} \boxed{2ndF} \boxed{VARS} \boxed{2}$ (Y2). Press $\boxed{2ndF} \boxed{QUIT} \boxed{CL}$ to return to and clear the calculation screen. Press $\boxed{2ndF} \boxed{VARS} \boxed{3}$ Y3 $\boxed{(} \boxed{4} \boxed{)} \boxed{ENTER}$.

COMPOSITION OF FUNCTIONS

1. Press $\boxed{Y=}$ and clear old expressions.
2. Enter the two functions to be composed for Y1 and Y2. For example, enter $y=x^2-1$ for Y1 by pressing \boxed{x} $\boxed{x^2}$ $\boxed{-}$ $\boxed{1}$ $\boxed{\text{ENTER}}$ and $y=x+1$ for Y2 by pressing \boxed{x} $\boxed{+}$ $\boxed{1}$ $\boxed{\text{ENTER}}$.
3. Enter the composition of Y2 into Y1 for Y3 by pressing $\boxed{2\text{ndF}}$ $\boxed{\text{VARS}}$ \boxed{A} $\boxed{1}$ (Y1) $\boxed{(}$ $\boxed{2\text{ndF}}$ $\boxed{\text{VARS}}$ $\boxed{2}$ (Y2) $\boxed{)}$ $\boxed{\text{ENTER}}$.
4. Keep Y1 and Y2 graphs from appearing by deselecting Y1 and Y2. Do this by pressing $\boxed{\blacktriangle}$ $\boxed{\blacktriangle}$ $\boxed{\blacktriangle}$ $\boxed{\blacktriangleleft}$ $\boxed{\text{ENTER}}$ $\boxed{\blacktriangledown}$ $\boxed{\text{ENTER}}$.
5. Press $\boxed{\text{ZOOM}}$ \boxed{A} $\boxed{7}$ (Dec) to view the composition of Y2 into Y1 in the decimal window.



6. Change the Y3 composition to Y1 in Y2 by pressing $\boxed{Y=}$ $\boxed{\blacktriangledown}$ $\boxed{\blacktriangledown}$ $\boxed{\text{CL}}$ $\boxed{2\text{ndF}}$ $\boxed{\text{VARS}}$ $\boxed{2}$ (Y2) $\boxed{(}$ $\boxed{2\text{ndF}}$ $\boxed{\text{VARS}}$ $\boxed{1}$ (Y1) $\boxed{)}$.
7. Press $\boxed{\text{ZOOM}}$ \boxed{A} $\boxed{7}$ (Decimal) to view the composition of Y1 into Y2 in the decimal window.



FORMULAS

1. Press **2ndF** **QUIT** **CL** to return to and clear the calculation screen.
2. To evaluate the formula for the area of a trapezoid ($\text{Area}=(h/2)(a+b)$), where 'h' is the height between the two bases ('a' and 'b') for different values, you must first type in the formula. For example, to enter the area formula for a trapezoid, press **(** **ALPHA** **H** **÷** **2** **)** **(** **ALPHA** **A** **+** **ALPHA** **B** **)** **ENTER**.
3. Now, store the values for 'h,' 'a,' and 'b' into the calculator. Use h=1, a=2, and b=3. Store these by pressing **1** **STO** **ALPHA** **H** **ENTER** **2** **STO** **ALPHA** **A** **ENTER** **3** **STO** **ALPHA** **B** **ENTER**.

1⇒H	1
2⇒A	2
3⇒B	3

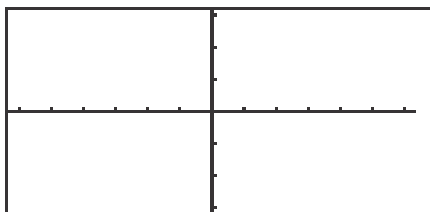
4. Clear the screen by pressing **CL**. Recall the formula by pressing **2ndF** **ENTRY** four times. Press **ENTER** to evaluate the formula for the stored values.

(H÷2)(A+B)	2.5
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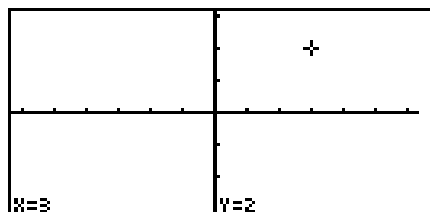
5. Change the height to 4 by pressing **4** **STO** **ALPHA** **H** **ENTER**. Recall the formula by pressing **2ndF** **ENTRY** two times and press **ENTER** to re-evaluate the formula for the new value.

GRAPHING CIRCLES

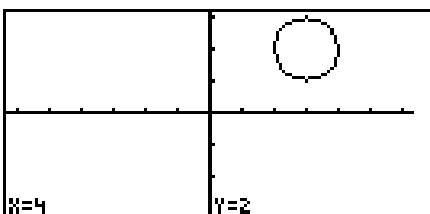
1. Press $\boxed{Y=}$ and clear old expressions. Press \boxed{ZOOM} \boxed{A} $\boxed{7}$ to view a clear viewing window.



2. To graph the circle in the form $(x-h)^2 + (y-k)^2 = r^2$, you will use the circle drawing feature. For example, in the circle $(x-3)^2 + (y-2)^2 = 1^2$, $h=3$, $k=2$ and $r=1$. Press $\boxed{2ndF}$ \boxed{DRAW} \boxed{A} $\boxed{9}$ (**Circle**). Move the cursor right to an 'h' of $x=3$ by pressing $\boxed{\blacktriangleright}$ repeatedly until $x=3$. Move the cursor up to a 'k' of $y=2$ by pressing $\boxed{\blacktriangleup}$ repeatedly until $y=2$. Press \boxed{ENTER} to set the center point.



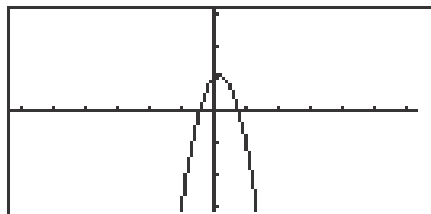
3. Move the cursor the length of the radius in one direction away from the center. In the example use the arrow key. Move the cursor 1 unit away from the center and press \boxed{ENTER} . The circle will be drawn with the cursor appearing at the point in the circle to which you moved.



4. If the circle will not completely appear in the viewing window, zoom out on the decimal window to a larger window, because any other windows may distort the circle. Draw the circle again in the larger window.

ZOOMING TO FIND ROOTS

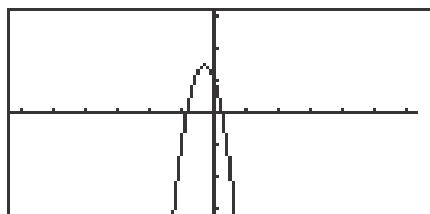
1. Turn the calculator on and press $\boxed{Y=}$. Y prompts will appear on the viewing window. Press \boxed{CL} to remove old Y expressions. Setup the calculator with rectangular coordinates and the equation editor mode by pressing $\boxed{2ndF}$ $\boxed{SET\ UP}$ \boxed{E} (**COORD**) $\boxed{1}$ (**Rect**) \boxed{G} (**EDITOR**) and $\boxed{1}$ (**Equation**). Press \boxed{CL} to exit the menu and return to the Y prompts.
2. To enter the polynomial $y = -3x^2 + x + 1$, press $\boxed{(-)}$ $\boxed{3}$ \boxed{x} $\boxed{x^2}$ $\boxed{+}$ \boxed{x} $\boxed{+}$ $\boxed{1}$.
3. Press \boxed{ZOOM} \boxed{A} (**Zoom**) $\boxed{7}$ (**Dec**) to establish the decimal viewing window and view the graph. Press \boxed{TRACE} to engage the trace feature. Press $\boxed{\blacktriangleleft}$ to move the cursor near the left-hand root.



4. Press \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{3}$ (**In**) to zoom in on the left-hand root. Press \boxed{TRACE} and move the tracer to approximate the root.
5. Press \boxed{ZOOM} \boxed{G} (**RCL**) $\boxed{2}$ (**PreWin**) to return to the decimal viewing window. Press \boxed{TRACE} and move the tracer to find the right-hand root.
6. Press \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{3}$ (**In**) to zoom in. Press \boxed{TRACE} and move the tracer to approximate the root.

JUMPING TO FIND ROOTS

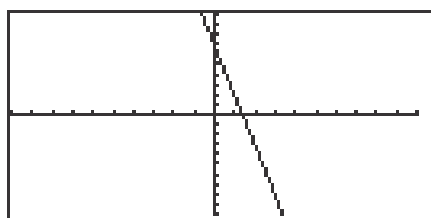
1. Press $\boxed{Y=}$ \boxed{CL} to return to and clear the Y1 prompt.
2. To enter the polynomial $y = -5x^2 - 3x + 1$, press $\boxed{(-)}$ $\boxed{5}$ \boxed{x} $\boxed{x^2}$ $\boxed{-}$ $\boxed{3}$ \boxed{x} $\boxed{+}$ $\boxed{1}$.
3. View the graph in the decimal viewing window by pressing \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{7}$ (**Dec**).



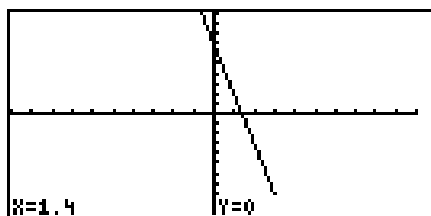
4. Press \boxed{TRACE} and move cursor to the left of the left-hand root. Press $\boxed{2ndF}$ \boxed{CALC} to view the calculate menu.
5. Press $\boxed{5}$ (**X_Incpt**) to find the left-hand root.
6. Press $\boxed{2ndF}$ \boxed{CALC} $\boxed{5}$ (**X_Incpt**) to find the next root.

INEQUALITIES

1. To solve $3(4 - 2x) \geq 5 - x$, rewrite it as $3(4 - 2x) - 5 + x \geq 0$ and determine the values of x where the function $y = 3(4 - 2x) - 5 + x$ is on or above the x -axis.
2. To do this, press $\boxed{Y=}$ \boxed{CL} and enter $3(4 - 2x) - 5 + X$ in the Y1 location.
3. Set the viewing window of the graph by pressing \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**). You should be able to clearly view the x -intercept.



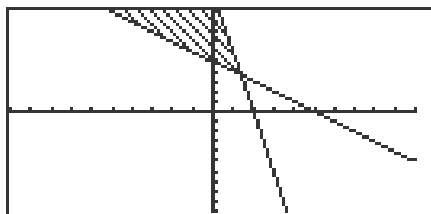
4. Locate the x -intercept at the point $(1.4, 0)$ by pressing $\boxed{2ndF}$ \boxed{CALC} and $\boxed{5}$ (**X_Incpt**).



5. Since the graph is above the x -axis, to the left of the x -intercept, the solution to the inequality $3(4 - 2x) - 5 + x \geq 0$ is all values of x such that $x \leq 1.4$.

INEQUALITIES

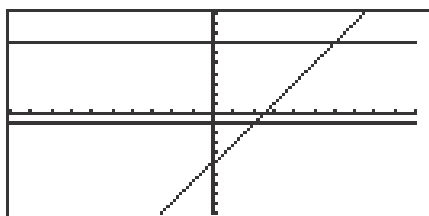
1. To solve the inequality $3(4 - 2x) \geq 5 - x$, press $\boxed{Y=}$ \boxed{CL} , enter $3(4 - 2X)$ for $Y1$ and $5 - X$ for $Y2$.
2. Set the viewing window by pressing \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**).
3. Next, shade the set of points that make the inequality true by pressing $\boxed{2ndF}$ \boxed{DRAW} \boxed{G} (**SHADE**) $\boxed{1}$ (**Set**) to access the "Set Shade" screen. Since the inequality you are solving is $Y1 \geq Y2$ the solution is where the graph of $Y1$ is "on the top" and $Y2$ is "on the bottom." Do this by pressing $\boxed{2ndF}$ \boxed{VARS} \boxed{A} \boxed{ENTER} $\boxed{2}$ $\boxed{\blacktriangleright}$ $\boxed{2ndF}$ \boxed{VARS} \boxed{ENTER} $\boxed{1}$. Press \boxed{GRAPH} to view the shaded region.



4. Press $\boxed{2ndF}$ \boxed{CALC} $\boxed{2}$ (**Intsct**) to find where the graphs intersect.
5. Since the shaded region is to the left of $x = 1.4$, the solution to the inequality $3(4 - 2x) \geq 5 - x$ is all values of x such that $x \leq 1.4$.
6. Turn off the shading by pressing $\boxed{2ndF}$ \boxed{DRAW} \boxed{G} (**SHADE**) $\boxed{2}$ (**INITIAL**).

DOUBLE INEQUALITIES

1. The inequality $-1 \leq 2x - 5 \leq 7$ is commonly referred to as a “double” inequality.
2. Clear any previously entered functions by pressing $\boxed{Y=}$ \boxed{CL} .
3. Enter $Y1 = -1$, $Y2 = 2X - 5$, and $Y3 = 7$.
4. Press \boxed{ZOOM} \boxed{A} (**ZOOM**) $\boxed{5}$ (**Default**) to view the line $y = 2x - 5$ between the lines $y = -1$ and $y = 7$.

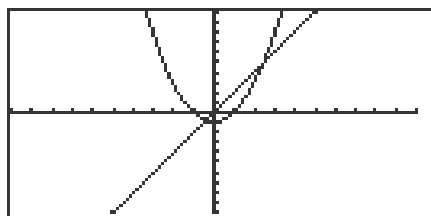


5. Press $\boxed{2ndF}$ \boxed{CALC} $\boxed{2}$ (**Intsct**) to find the point of intersection of the lines $y = 2x - 5$ and $y = -1$ at $(2, -1)$. Press $\boxed{\blacktriangle}$ to move the tracer to the $y = 7$ line. Press $\boxed{2ndF}$ \boxed{CALC} $\boxed{2}$ (**Intsct**) to find $y = 2x - 5$ and $y = 7$ at $(6, 7)$.
6. The solution to the “double” inequality $-1 \leq 2x - 5 \leq 7$ consists of all values of x in between, and including, 2 and 6 (i.e., $x \geq 2$ and $x \leq 6$). The solution is $2 \leq x \leq 6$.

SOLVING A SYSTEM OF EQUATIONS

Graphing a system of equations and using the calculate feature to find the solutions

1. Turn the calculator on and press $\boxed{Y=}$.
2. Press \boxed{CL} to clear an old Y1 expression. Press \boxed{ENTER} \boxed{CL} to clear additional Y prompts.
3. To enter the system of equations:
 $y = x^2 - 1$
 $y = 2x$
press \boxed{x} $\boxed{x^2}$ $\boxed{-}$ $\boxed{1}$ \boxed{ENTER} $\boxed{2}$ \boxed{x} . View the graphs by pressing \boxed{ZOOM} \boxed{A} (Zoom) $\boxed{5}$ (Default).



4. Press $\boxed{2ndF}$ \boxed{CALC} to access the calculate feature. Press $\boxed{2}$ (Intsct). The left-hand intersection will appear on the screen.
5. Press $\boxed{2ndF}$ \boxed{CALC} to access the calculate feature again. Press $\boxed{2}$ (Intsct). The right-hand intersection will appear on the screen.