Sharp EL-9900 Graphing Calculator

Basic Keyboard Activities

General Mathematics

Algebra

Programming

Advanced Keyboard Activities

Algebra

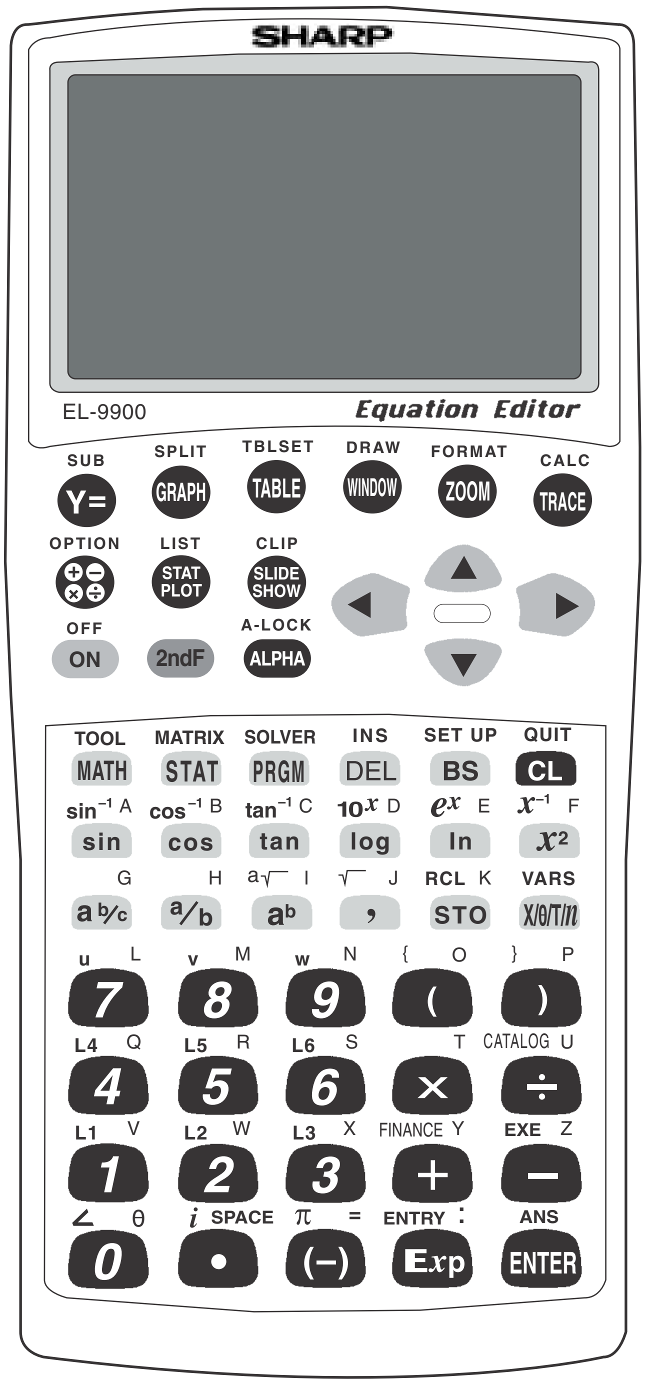
Calculus

Statistics

Trigonometry

Programming

Sharp EL-9900
Graphing Calculator
Advanced Keypad

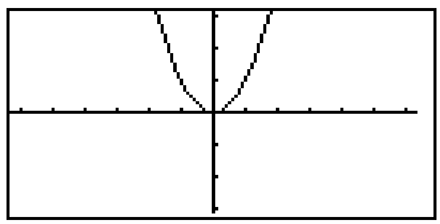


QUADRATIC EQUATIONS

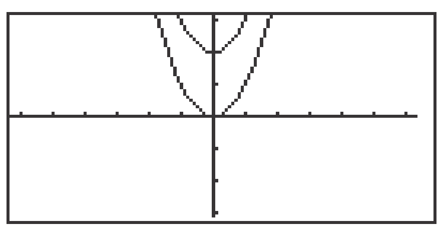
Graphing and translations of quadratic equations

1. Turn the calculator on and press $\boxed{\text{Y=}}$. Press $\boxed{\text{CL}}$ to remove an old Y1 expression. Press $\boxed{\text{ENTER}}$ $\boxed{\text{CL}}$ to remove an old Y2 expression.

2. To enter the quadratic equation ($y = x^2$) for Y1, press $\boxed{\text{X/θ/T/}n}$ $\boxed{x^2}$.
   Enter the viewing window range by pressing $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(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 $\boxed{\text{Y=}}$ $\boxed{\blacktriangledown}$ $\boxed{\text{X/θ/T/}n}$ $\boxed{x^2}$ $\boxed{+}$ $\boxed{2}$. Press $\boxed{\text{GRAPH}}$.
   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 $\boxed{\text{Y=}}$ $\boxed{\blacktriangledown}$ $\boxed{\text{CL}}$ $\boxed{\text{X/θ/T/}n}$ $\boxed{x^2}$ $\boxed{-}$ $\boxed{2}$.
   $\boxed{\text{ENTER}}$ $\boxed{\text{GRAPH}}$. What does the addition of $^-2$ do?

5. Summarize the effect of k within the standard equation $y = a(x - h)^2 + k$.

FORMULAS OR LITERAL EQUATIONS

Steps for solving an equation using the equation method

1. Turn the calculator on and press 2ndF SOLVER to access the solver feature. A blank screen should appear. If the screen is not blank, then press CL to clear the screen.

2. Select the Equation method for solving by pressing 2ndF SOLVER, A **(METHOD)** 1 **(Equation)**.

3. Enter the formula $P = L\left[\dfrac{1-(1+I\div 12)^{-N}}{I\div 12}\right]^{-1}$

   Press ALPHA P ALPHA = ALPHA L (a/b 1 – (1 + ALPHA I ÷ 1 2) a^b (-) ALPHA N ▶ ▶ ALPHA I ÷ 1 2 ▶) a^b (-) 1 .

   This equation is referred to as the amortization formula, with a loan (L) with a fixed rate of interest (I).

4. Press ENTER to view the variable list. To find the monthly payment on a $15,000 car loan made at 9% interest over four years (48 months), enter the values by pressing ▼ 1 5 0 0 0 ENTER • 0 9 ENTER 4 8 ENTER . Press ▲ ▲ ▲ and notice the payment (P) is now highlighted by the cursor, press 2ndF EXE to solve for the payment.

5. Pressing CL will return you to the variable screen. You can now change or solve for any of the values. Save this formula by pressing 2ndF SOLVER C **(SAVE)** ENTER and entering the formula name. Give the formula the name AMORT by pressing A M O R T ENTER.

FORMULAS OR LITERAL EQUATIONS

Steps for solving an equation using the graphic method

1. Turn the calculator on and press 2ndF SOLVER to access the solver feature. Press CL to clear the formula entry screen.
   Select the Graphic method for solving by pressing 2ndF SOLVER A **(METHOD)** 3 **(Graphic)**.

2. Enter the formula V = $\pi r^2 h$ by pressing ALPHA V ALPHA = 2ndF π ALPHA R a^b 2 ▶ ALPHA H .

3. This equation is the formula for calculating the volume of a cylinder (V) in terms of the cylinder's height (H) and radius (R). Press ENTER to view the variable list.

4. To find the radius of a cylinder with a volume of 30 cubic inches, and a height of 10 inches, enter the values by pressing 3 0 ENTER ▼ 1 0 ENTER . Press ▲ and notice the radius (R) is now highlighted by the cursor.

5. Press 2ndF EXE to solve for the radius. The graphic solver will prompt you for a variable range to solve within. Set the variable range to 0 and 2 by pressing 0 ENTER 2 ENTER .

6. Press 2ndF EXE to solve.

7. Pressing CL will return you to the variable screen. You can now change or solve for any of the values. Save this formula by pressing 2ndF SOLVER , C **(SAVE)** pressing ENTER , and entering the formula name. Give the formula the name VCYL by pressing V C Y L ENTER .

FORMULAS OR LITERAL EQUATIONS

Solving an equation using Newton's method

1. Press [2ndF] [SOLVER] to enter the solver feature. Press [CL] to clear the formula entry screen.

2. Select the Newton's method for solving by pressing [2ndF] [SOLVER], [A] **(METHOD)** [2] **(Newton)**. Enter the formula $A = \frac{1}{2} H(B + C)$ by pressing [ALPHA] [A] [ALPHA] [=] [1] [a/b] [2] [▶] [ALPHA] [H] [(] [ALPHA] [B] [+] [ALPHA] [C] [)] .

3. Press [ENTER] to view the variable list. To find the height of a trapezoid with an area of 25 in^2, and bases of length 5 and 7 inches, enter the values by pressing [2] [5] [ENTER] [▼] [5] [ENTER] [7] [ENTER] [▲] [▲].
   Notice the height (H) is now highlighted by the cursor.

4. Press [2ndF] [EXE] to continue. Newton's method will prompt you for a guess or starting point. Enter a starting point of 1 by pressing [1] [ENTER].

5. Press [2ndF] [EXE] to solve. A height of 4.1667 will appear on the screen.

6. Pressing [CL] will return you to the variable screen. You can now change or solve for any of the values. Save this formula by pressing [2ndF] [SOLVER], [C] **(SAVE)** [ENTER] and entering the formula name. Give the formula the name "ATRAP," by pressing [A] [T] [R] [A] [P] [ENTER].

GRAPHING POLYNOMIALS AND FINDING THE ROOTS

Graphing a polynomial and zooming to find the roots

1. Turn the calculator on and press [Y=]. Y prompts will appear on the viewing window. Press [CL] to remove old Y expressions. Setup the calculator with rectangular coordinates and the equation editor mode by pressing [2ndF] [SET UP] [E] **(COORD)** [1] **(Rect)** [G] **(EDITOR)** and [1] **(Equation)**. Press [CL] to exit the menu and return to the Y prompts.

2. To enter the polynomial $y = x^3 - 3x^2 + x + 1$, press [X/θ/T/*n*] [a^b] [3] [▶] [–] [3] [X/θ/T/*n*] [x^2] [+] [X/θ/T/*n*] [+] [1] .

3. Press [ZOOM] [A] **(Zoom)** [7] **(Dec)** to establish the decimal viewing window and view the graph. Press [TRACE] to engage the trace feature. Press [◀] to move the cursor near the left-hand root.

4. Set the zoom factors to 5 by pressing [ZOOM] [B] **(FACTOR)** press [ENTER] [5] [ENTER] [5] [ENTER] . Press [ZOOM] [A] **(ZOOM)** [3] **(In)** to zoom in on the left- hand root. Press [TRACE] and move the tracer to approximate the root.

5. Press [ZOOM] [H] **(RCL)** [2] **(PreWin)** to return to the decimal viewing window. Press [TRACE] and move the tracer to find the middle root.

6. Press [▶] repeatedly to move the tracer near the right-hand root. Press [ZOOM] [A] **(ZOOM)** [3] **(In)** to zoom in. Press [TRACE] and move the tracer to approximate the root.

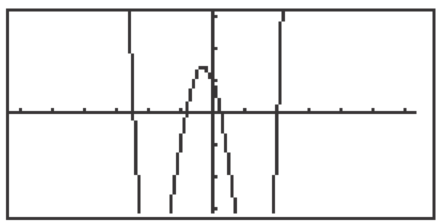
GRAPHING POLYNOMIALS AND FINDING THE ROOTS

Graphing a polynomial and jumping to find the roots

1. Press [Y=] [CL] to return to and clear the Y1 prompt.

2. To enter the polynomial $y = x^4 + x^3 - 5x^2 - 3x + 1$, press [X/θ/T/n] [a^b] [4] [▶] [+] [X/θ/T/n] [a^b] [3] [▶] [−] [5] [X/θ/T/n] [x^2] [−] [3] [X/θ/T/n] [+] [1].

3. View the graph in the decimal viewing window by pressing [ZOOM] [A] **(ZOOM)** [7] **(Dec).**



4. Press [TRACE] and move cursor to the left of the left-hand root. Press [2ndF] [CALC] to view the calculate menu.

5. Press [5] **(X_Incpt)** to find the left-hand root.

6. Press [2ndF] [CALC] [5] **(X_Incpt)** to find the next root.

7. Press [2ndF] [CALC] [5] **(X_Incpt)** to find the next root.

8. Press [2ndF] [CALC] [5] **(X_Incpt)** to find the next root.

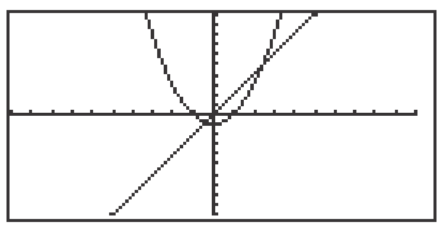
SOLVING A SYSTEM OF EQUATIONS

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

1. Turn the calculator on and press [Y=] .

2. Press [CL] to clear an old Y1 expression. Press [ENTER] [CL] to clear additional Y prompts.

3. To enter the system of equations: $y = x^2 - 1$, $y = 2x$
   press [X/θ/T/*n*] [x^2] [–] [1] [ENTER] [2] [X/θ/T/*n*] . View the graphs by pressing [ZOOM] [A] **(Zoom)** [5] **(Default)**.



4. Press [2ndF] [CALC] to access the calculate feature. Press [2] **(Intsct)**. The left-hand intersection will appear on the screen.

5. Press [2ndF] [CALC] to access the calculate feature again. Press [2] **(Intsct)**. The right-hand intersection will appear on the screen.

SOLVING A SYSTEM OF EQUATIONS

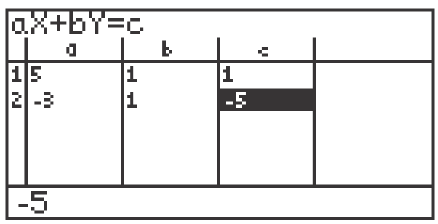
Solving a system of linear equations using the tool feature

1. Press $\boxed{\text{2ndF}}$ $\boxed{\text{TOOL}}$ to access the tool menu.

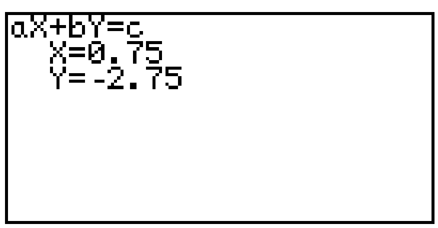
2. Press $\boxed{\text{B}}$ **(SYSTEM)** $\boxed{\text{2}}$ **(2)** to view the entry screen for solving a linear-system of equations. Systems up to six variables and six equations can be solved.

3. To enter the system of equations: $5x + y = 1$
    $^{-}3x + y = {}^{-}5$

   Press $\boxed{\text{5}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{(-)}$ $\boxed{\text{3}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{(-)}$ $\boxed{\text{5}}$ $\boxed{\text{ENTER}}$.



4. Press $\boxed{\text{2ndF}}$ $\boxed{\text{EXE}}$ to solve the system.



MATRIC SOLUTIONS TO SYSTEMS OF LINEAR EQUATIONS

1. Press $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ to access the matrix menu.

2. Press $\boxed{\text{B}}$ **(EDIT)** $\boxed{\text{1}}$ **(mat A)** to select matrix A.

3. Now, enter the size or dimension of the matrix. We will enter the 3×3 matrix. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & -1 \\ 1 & 1 & -2 \end{bmatrix}$

   Press $\boxed{\text{3}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{3}}$ $\boxed{\text{ENTER}}$ to set the dimension of the matrix at three rows by three columns.

4. The calculator will now prompt you for the matrix. Enter the elements of the matrix by pressing $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{2}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{2}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{(-)}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ $\boxed{\text{ENTER}}$ $\boxed{(-)}$ $\boxed{\text{2}}$ $\boxed{\text{ENTER}}$.

5. Press $\boxed{\text{2nd}}$ $\boxed{\text{QUIT}}$ to exit the display of matrix A.

6. Repeat the process to enter a 3×3 matrix B = $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$.

7. Matrix multiplication can be performed if the number of columns of the first matrix is equal to the number of rows of the second matrix. In the matrix multiplication $A \times B$, the elements in the first row of A are multiplied to the corresponding elements in the first column of B. The sum of these multiplications is placed in the 1,1(first row, first column) position of the resulting matrix. This process is repeated until each row of A has been multiplied to each column of B. Press $\boxed{\text{2nd}}$ $\boxed{\text{QUIT}}$ to leave matirx entry mode.

8. To multiply the matrices A and B together, press $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{A}}$ **(NAME)** $\boxed{\text{1}}$ **(mat A)** $\boxed{\times}$ $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{2}}$ **(mat B)** and $\boxed{\text{ENTER}}$.

MATRIC SOLUTIONS TO SYSTEMS OF LINEAR EQUATIONS

1. The calculator will directly establish an identity matrix of a given size by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{C}}$ **(OPE)** $\boxed{0}$ $\boxed{5}$ **(identity)** and pressing $\boxed{3}$ $\boxed{\text{ENTER}}$. To save the identity matrix in matrix C, press $\boxed{\text{STO}}$ $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{A}}$ **(NAME)** $\boxed{3}$ **(mat C)** $\boxed{\text{ENTER}}$. Confirm that the identity matrix is stored in matrix C by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{B}}$ **(EDIT)** $\boxed{3}$ **(mat C)**. Press $\boxed{\text{2ndF}}$ $\boxed{\text{QUIT}}$ to exit the matrix editor and press $\boxed{\text{CL}}$ to clear the screen.

2. Find the inverse of the square matrix A by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{A}}$ **(NAME)** $\boxed{1}$ **(mat A)** $\boxed{\text{2ndF}}$ $\boxed{x^{-1}}$ $\boxed{\text{ENTER}}$. Press $\boxed{\blacktriangleright}$ to see more of the matrix.

3. To solve the system of equations
$$\begin{aligned} x + 2y + z &= 8 \\ 2x + y - z &= 1 \\ x + y - 2z &= {}^{-}3 \end{aligned}$$
using matrices, use the matrix A entered previously as the coefficient matrix, and enter the constants on the right side of the equal sign into matrix B, where $B = \begin{bmatrix} 8 \\ 1 \\ {}^{-}3 \end{bmatrix}$.
Press $\boxed{\text{2ndF}}$ $\boxed{\text{QUIT}}$ to exit the display of the B matrix. The solution matrix X is found by multiplying mat A^{-1} B • mat B.

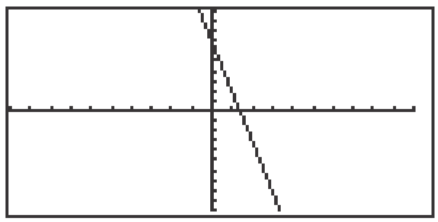
4. This multiplication is derived from the equation AX= B,
$A^{-1} \bullet A \bullet X = A^{-1} \bullet B$ (multiply both sides by A^{-1})
$I \bullet X = A^{-1} \bullet B$ ($A^{-1} \bullet A = I$, identity matrix)
$X = A^{-1} \bullet B$ ($I \bullet X = X$)
Multiply $A^{-1} \bullet B$ by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{A}}$ **(NAME)** $\boxed{1}$ (**mat A)** $\boxed{\text{2ndF}}$ $\boxed{x^{-1}}$ $\boxed{\times}$ $\boxed{\text{2ndF}}$ $\boxed{\text{MATRIX}}$ $\boxed{\text{A}}$ **(NAME)** $\boxed{2}$ **(mat B)** and $\boxed{\text{ENTER}}$.
The solution matrix will appear.

INEQUALITIES

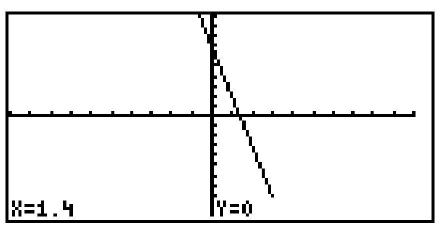
1. To solve $3(4 - 2x) \geq 5 - x$, rewrite it as $3(4 - 2x) - 5 + x \geq 0$ and determine the values of x where the function $y = 3(4 - 2x) - 5 + x$ is on or above the x-axis.

2. To do this, press [Y=] [CL] and enter $3(4 - 2x) - 5 +$ X in the Y1 location.

3. Set the viewing window of the graph by pressing [ZOOM] [A] **(ZOOM)** [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 [2ndF] [CALC] and [5] **(X_Incpt)**.



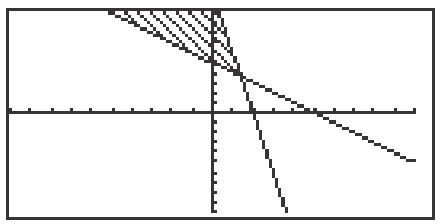
5. Since the graph is above the x-axis, to the left of the x-intercept, the solution to the inequality $3(4 - 2x) - 5 + x \geq 0$ is all values of x such that $x \leq 1.4$.

INEQUALITIES

1. To solve the inequality $3(4 - 2x) \geq 5 - x$, press [Y=] [CL], enter 3(4 – 2X) for Y1 and 5 – X for Y2.

2. Set the viewing window by pressing [ZOOM] [A] **(ZOOM)** [5] **(Default)**.

3. Next, shade the set of points that make the inequality true by pressing [2ndF] [DRAW] [G] **(SHADE)** [1] **(Set)** to access the “Set Shade” screen. Since the inequality you are solving is Y1 ≥ Y2 the solution is where the graph of Y1 is “on the top” and Y2 is "on the bottom." Do this by pressing [2ndF] [VARS] [A] [ENTER] [2] [▶] [2ndF] [VARS] [ENTER] [1]. Press [GRAPH] to view the shaded region.



4. Press [2ndF] [CALC] [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 [2ndF] [DRAW] [G] **(SHADE)** [2] **(INITIAL)**.

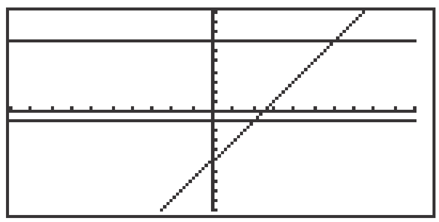
DOUBLE INEQUALITIES

1. The inequality $^-1 \le 2x - 5 \le 7$ is commonly referred to as a “double” inequality.

2. Clear any previously entered functions by pressing $\boxed{\text{Y=}}$ $\boxed{\text{CL}}$.

3. Enter Y1 = $^-1$, Y2 = 2X – 5, and Y3 = 7.

4. Press $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(ZOOM)** $\boxed{5}$ **(Default)** to view the line $y = 2x - 5$ between the lines y = $^-1$ and $y = 7$.



5. Press $\boxed{\text{2ndF}}$ $\boxed{\text{CALC}}$ $\boxed{2}$ **(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 $\boxed{\text{2ndF}}$ $\boxed{\text{CALC}}$ $\boxed{2}$ **(Intsct)** to find $y = 2x - 5$ and $y = 7$ at (6, 7).

6. The solution to the “double” inequality $^-1 \le 2x - 5 \le 7$ consists of all values of x in between, and including, 2 and 6 (i.e., $x \ge 2$ and $x \le 6$). The solution is $2 \le x \le 6$.

SYSTEMS OF INEQUALITIES

1. The solution region of a system of inequalities consists of all points (a, b) such that when $x = a$ and $y = b$, all inequalities in the system are true.

2. For example, to graph the solution region for the system

   $2x + y \geq 1$

   $x^2 + y \leq 1$,

   first rewrite each inequality in the system so that the left-hand-side is y:

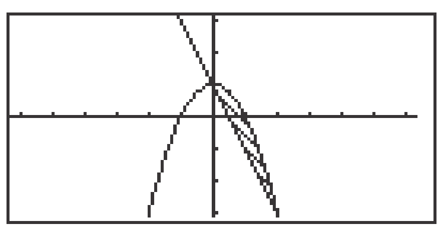
   $y \geq 1 - 2x$

   $y \leq 1 - x^2$

3. Press [Y=] [CL] and enter 1 – 2X in Y1 and 1 – X^2 in Y2.

4. Next, shade the points that have a y-value less than Y2 and greater than Y1. Do this by pressing [2ndF] [DRAW] [G] **(SHADE)** [1] **(Set)** [2ndF] [VARS] [A] [ENTER] [1] [▶] [2ndF] [VARS] [ENTER] [2] .

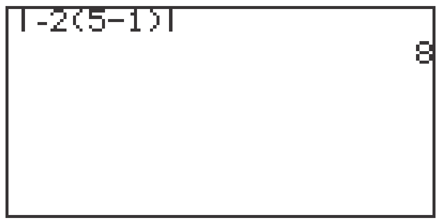
5. Graph the system by pressing [ZOOM] [A] **(ZOOM)** [7] **(Dec)**.



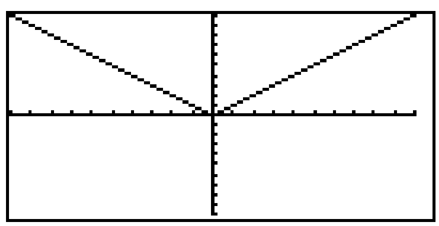
6. Turn off the shading by pressing [2ndF] [DRAW] [G] **(SHADE)** [2] **(INITIAL)**.

ABSOLUTE VALUE

1. Evaluate $|{}^{-}2(5-1)|$ by pressing [+ − × ÷] to access the home or computation screen. Enter the absolute value symbol by pressing [MATH] [B] **(NUM)** [1] **(abs)**. You should see | □ | on the screen. Enter -2(5-1) inside the absolute value symbols and evaluate by pressing [(−)] [2] [(] [5] [−] [1] [)] [ENTER] .



2. Graph $y = |x|$ by pressing [Y=] [CL] to clear the Y1 prompt. Press [ENTER] [CL] to clear the remaining prompts if necessary. Enter $|x|$ in Y1 by pressing [MATH] [B] **(NUM)** [1] **(abs)** and pressing [X/θ/T/*n*] . Press [ZOOM] **[A]** **(ZOOM)** [5] **(Default)** to draw the graph.



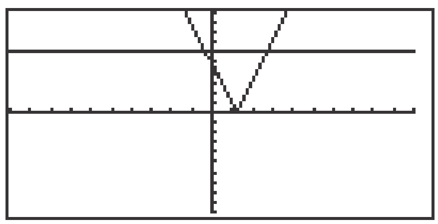
ABSOLUTE VALUE EQUATIONS

1. Solve $|5 - 4x| = 6$ by first pressing [Y=] [CL] to clear the Y1 prompt.

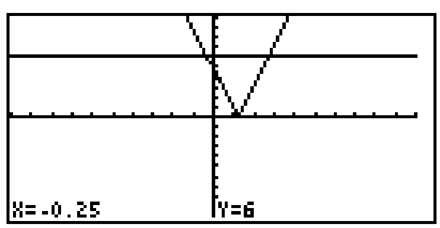
2. Enter $|5 - 4x|$ in Y1 with the keystrokes [MATH] [B] **(NUM)** [1] **(abs)** [5] [–] [4] [X/θ/T/*n*] .

3. Next, press [ENTER] [CL] [6] to enter 6 in Y2.

4. Press [ZOOM] [A] **(ZOOM)** [5] **(Default)** to view the two points of intersection of the absolute value and the horizontal line $y = 6$.



5. Press [2ndF] [CALC] [2] **(Intsct)** to find one point of intersection of the two graphs. Press [2ndF] [CALC] [2] (**Intsct)** again to find the other point of intersection.



6. The solution to the equation $|5 - 4x| = 6$ consists of the two values $^-0.25$ and 2.75.

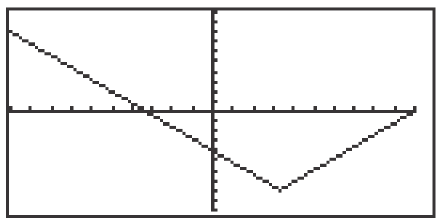
ABSOLUTE VALUE INEQUALITIES

1. To solve $\left|\frac{20 - 6x}{5}\right| < 8$, rewrite the inequality so that the right-hand side of the inequality is zero: $\left|\frac{20 - 6x}{5}\right| - 8 < 0$.

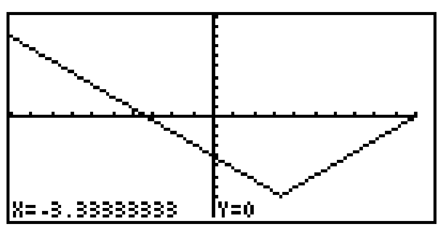
2. Press $\boxed{\text{Y=}}$ and clear all the Y prompts.

3. Enter the left-hand side of the inequality $\left|\frac{20 - 6x}{5}\right| - 8$ in Y1 by pressing $\boxed{\text{MATH}}$ $\boxed{\text{B}}$ **(NUM)** $\boxed{\text{1}}$ **(abs)** $\boxed{\text{a/b}}$ $\boxed{\text{2}}$ $\boxed{\text{0}}$ $\boxed{-}$ $\boxed{\text{6}}$ $\boxed{\text{X/}\theta\text{/T/}n}$ $\boxed{\blacktriangleright}$ $\boxed{\text{5}}$ $\boxed{\blacktriangleright}$ $\boxed{\blacktriangleright}$ $\boxed{-}$ $\boxed{\text{8}}$.

4. Graph the expression by pressing $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(Zoom)** $\boxed{\text{5}}$ **(Default)**. The *x*-intercepts of the graph are clearly visible.



5. Press $\boxed{\text{2ndF}}$ $\boxed{\text{CALC}}$ $\boxed{\text{5}}$ **(X_Incpt)** to find the first *x*-intercept. Press $\boxed{\text{2ndF}}$ $\boxed{\text{CALC}}$ $\boxed{\text{5}}$ **(X_Incpt)** to find the second *x*-intercept.



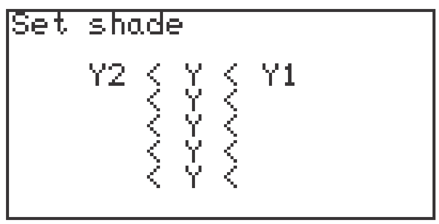
6. Since the graph is below the *x*-axis for *x* in between the two *x*-intercepts, the solution is $^{-}3.33 < x < 10$.

ABSOLUTE VALUE INEQUALITIES

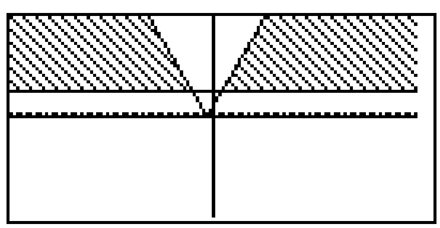
1. To solve the inequality $|3.5x + 4| \geq 10$, press $\boxed{\text{Y=}}$ $\boxed{\text{CL}}$ to clear the Y1 prompt. Press $\boxed{\text{ENTER}}$ $\boxed{\text{CL}}$ to clear additional prompts.

2. Enter the function $|3.5x + 4|$ in Y1 by pressing $\boxed{\text{MATH}}$ $\boxed{\text{B}}$ **(NUM)** $\boxed{\text{1}}$ **(abs)** $\boxed{\text{3}}$ $\boxed{\bullet}$ $\boxed{\text{5}}$ $\boxed{\text{X/}\theta\text{/T/}n}$ $\boxed{+}$ $\boxed{\text{4}}$ $\boxed{\text{ENTER}}$. Enter 10 in Y2 by pressing $\boxed{\text{1}}$ $\boxed{\text{0}}$.

3. Access the Set Shade screen by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{DRAW}}$ $\boxed{\text{G}}$ **(SHADE)** $\boxed{\text{1}}$ **(SET)**. Since Y2 is the function "on the bottom," press $\boxed{\text{2ndF}}$ $\boxed{\text{VARS}}$ $\boxed{\text{A}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{2}}$ (Y2) and since Y1 is the function "on the top," press $\boxed{\blacktriangleright}$ $\boxed{\text{2ndF}}$ $\boxed{\text{VARS}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{1}}$ (Y1).



4. Set the viewing window by pressing $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(Zoom)** $\boxed{\text{5}}$ **(Default)**. Press $\boxed{\text{ZOOM}}$ $\boxed{\text{4}}$ **(out)** to see the intersection.



5. Press $\boxed{\text{2ndF}}$ $\boxed{\text{CALC}}$ $\boxed{\text{2}}$ **(Intsct)** to locate a point of intersection. Repeat to find the other. The intersections are ($^{-}4$, 10) and (1.714, 10). The solution of the inequality $|3.5x + 4| > 10$ is all values of x such that $x \leq {}^{-}4$ or $x \geq 1.714$.

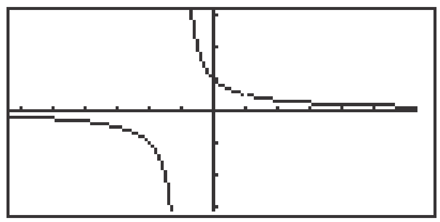
6. Turn off the shading by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{DRAW}}$ $\boxed{\text{G}}$ **(SHADE)** $\boxed{\text{2}}$ **(INITIAL)**.

RATIONAL FUNCTIONS

1. Graph the rational function $f(x) = \frac{(x-1)}{(x^2-1)}$ by first pressing [Y=] [CL] to clear the Y1 prompt. Press [ENTER] [CL] to clear additional Y prompts.

2. Enter Y1 = $\frac{(x-1)}{(x^2-1)}$ by pressing [a/b] [X/θ/T/n] [–] [1] [▶] [X/θ/T/n] [x^2] [–] [1].

3. Graph in the decimal window by pressing [ZOOM] [A] **(ZOOM)** [7] **(Dec)**.



4. The function consists of two branches separated by the vertical asymptote (the line $x = {}^{-}1$). Look closely at the graph and observe the "hole" in it at $x = 1$. Press [TRACE] and investigate the "hole." Note that the hole will be seen only when the window is a "friendly" or decimal window.

5. Notice that there are no x-intercepts for the graph. The y-intercept can easily be found at $x = 0$, $y = 1$ by pressing [2ndF] [CALC] and [6] **(Y_Incpt)**.

6. Observe that the line $y = 0$ is very likely a horizontal asymptote of $f(x)$.

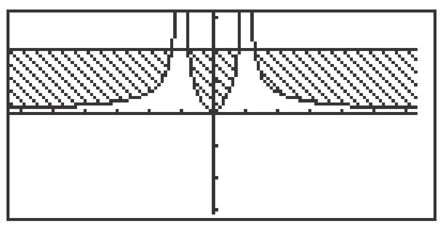
RATIONAL INEQUALITIES

1. Solve the inequality $\left|\frac{x}{(1-x^2)}\right| \leq 2$ using the intersection method with shading, by first pressing [Y=] [CL] to clear the Y1 prompt.

2. Enter the left-hand side of the inequality in Y1 by pressing [MATH] [B] **(NUM)** [1] **(abs)** pressing [a/b] [X/θ/T/*n*] [▶] [1] [–] [X/θ/T/*n*] [x^2] [ENTER]. Enter 2 in Y2 by pressing [2] [ENTER].

3. Press [2ndF] [DRAW] [G] **(SHADE)** [1] **(SET)** [2ndF] [VARS] [A] [ENTER] [1] (Y1) [▶] [2ndF] [VARS] [ENTER] [2] (Y2).

4. View the graph by pressing [ZOOM] [A] **(ZOOM)** [7] **(Dec)**.



5. Press [2ndF] [CALC] [2] **(Intsct)** repeatedly, to locate the *x*-values of the points of intersection, $x = {}^-1.281$, $^-0.781$, 0.781, and 1.281. The solution is all values of x such that $x \leq {}^-1.281$ or $^-0.781 \leq x \leq 0.781$ or $x \geq 1.281$.

6. Turn off the shading by pressing [2ndF] [DRAW] [G] **(SHADE)** [2] **(INITIAL)**.

CONIC SECTIONS

Steps for graphing a parabola in rectangular mode

1. Graph the parabola $x = y^2 - 2$ by first rewriting as $y = \pm\sqrt{(x + 2)}$.

2. Press $\boxed{\text{Y=}}$ $\boxed{\text{CL}}$ to clear the Y1 prompt. Press $\boxed{\text{ENTER}}$ $\boxed{\text{CL}}$ to clear additional prompts. Enter $\sqrt{(x + 2)}$ in Y1 with the keystrokes $\boxed{\text{2ndF}}$ $\boxed{\sqrt{\ }}$ $\boxed{\text{X/}\theta\text{/T/}n}$ $\boxed{+}$ $\boxed{2}$.

3. Press $\boxed{\text{ENTER}}$ and enter $^-\text{Y1} = {}^-\sqrt{(x + 2)}$ in Y2 with the key strokes $\boxed{(-)}$ $\boxed{\text{2ndF}}$ $\boxed{\text{VARS}}$ $\boxed{\text{A}}$ **(EQVARS)** $\boxed{\text{ENTER}}$ $\boxed{1}$ **(Y1)**.

4. View the graph by pressing $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(ZOOM)** $\boxed{7}$ **(Dec)**.

Steps for graphing a parabola in parametric mode

1. Change to parametric mode by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{SET UP}}$ $\boxed{\text{E}}$ **(COORD)** $\boxed{2}$ **(Param)**. Press $\boxed{\text{2ndF}}$ $\boxed{\text{QUIT}}$ to exit the set-up screen.

2. Press $\boxed{\text{Y=}}$ $\boxed{\text{CL}}$ to clear the X1T prompt. To rewrite $x = y^2 - 2$ in parametric form, simply let $y = \text{T}$ and substitute in $x = y^2 - 2$ to obtain $x = \text{T}^2 - 2$. Enter $\text{X1T} = \text{T}^2 - 2$ in the calculator by pressing $\boxed{\text{X/}\theta\text{/T/}n}$ $\boxed{x^2}$ $\boxed{-}$ $\boxed{2}$ $\boxed{\text{ENTER}}$. Enter $\text{Y1T} = \text{T}$ by pressing $\boxed{\text{X/}\theta\text{/T/}n}$.

3. View the graph by pressing $\boxed{\text{ZOOM}}$ $\boxed{\text{A}}$ **(ZOOM)** $\boxed{7}$ **(Dec)**.

4. Notice that only a half of the parabola is drawn. To see the rest of the parabola, press $\boxed{\text{WINDOW}}$ and adjust the Tmin. Set Tmin to $^-6$ by pressing $\boxed{(-)}$ $\boxed{6}$ $\boxed{\text{ENTER}}$. Press $\boxed{\text{GRAPH}}$ to view the complete parabola.

5. Change the calculator back to rectangular mode by pressing $\boxed{\text{2ndF}}$ $\boxed{\text{SET UP}}$ $\boxed{\text{E}}$ **(COORD)** $\boxed{1}$ **(Rect)**.

CONIC SECTIONS (continued)

Steps for graphing a circle in rectangular mode

1. To graph the circle $x^2 + y^2 = 4$, solve for y in terms of x. The result is $y = \pm\sqrt{4 - x^2}$.

2. Press [Y=] [CL] to clear the Y1 prompt. Enter Y1 = $\sqrt{(4 - X^2)}$ by pressing [2ndF] [√] [4] [–] [X/θ/T/n] [x^2] [ENTER] and then enter Y2 = $^-\sqrt{(4 - X^2)}$ by pressing [CL] [(–)] [2ndF] [VARS] [A] **(EQVARS)** [ENTER] [A] **(XY)** [1] **(Y1)**. View the graph by pressing [ZOOM] [A] **(ZOOM)** [7] **(Dec)**.

Steps for graphing a circle not in standard form

1. First solve the equation for y by completing the square on the y-term and solving for y. For example, draw the graph of the circle $x^2 - 2x + y^2 + 4y = 2$ by rewriting as $y = \pm\sqrt{(6 - x^2 + 2x)} - 2$.

2. Enter Y1 = $\sqrt{(6 - x^2 + 2x)}$, Y2 = Y1 – 2 and Y3 = $^-$Y1 – 2. "Turn off" Y1 so that it will not graph by pressing [▲] to move the blinking cursor to the Y1 expression. Press [◀] to position the blinking cursor over the = sign, and press [ENTER] so that "=" is no longer darkened.

3. To view the graph, press [ZOOM] [7] **(Dec)**.

4. Adjust the screen to see the bottom part of the circle by pressing [ZOOM] [A] **(ZOOM)** [4] **(OUT)**.