TI–83 Labs For Statistics 213

Probability and Decision Theory

by

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Attendance	Chapter	Topics	Description
1	1	Graphing functions	WINDOW, Y =, white (−) versus blue −
1	1	Tables for functions	2nd TBLSET, TABLE
1	1	Evaluating functions	VARS Y–VAR ENTER (value)
1	1	Intersection of functions by grapher	GRAPH, 2nd TRACE
1	1	On and Off	
1	1	Lists	$L_1, \ldots, L_6$
1	1	Linear Regression	STAT CALC LinReg
2	2	Row–Reduced Form	2nd MATRIX rref(
2	2	Gauss–Jordan Matrix Operations	2nd MATRIX EDIT, 2nd MATRIX MATH *row(and *row+(
3	2	Matrix operations	2nd MATRIX MATH T (transpose), −1 (inversion)
4	3	Graphical Solution Linear Programs	WINDOW, Y=, 2nd DRAW Shade or Y= backslash
5	4	Simplex Method	2nd MATRIX *row(and *row+
6	4	no instructions	
7	5	Compound interest	2nd FINANCE ENTER TVM Solver
8	6	Factorials, Permutation, Combination	MATH PRB
9	7	no instructions	
10	7	no instructions	
11	8	Discrete Probability Distribution	$L_1, \ldots$
11	8	Expected Value and Variance	$L_1, \ldots$
11	8	Binomial Probability Distribution	2nd DISTR binompdf
11	8	Binomial Cumulative Distribution	2nd DISTR binomcdf
12	8	Probabilities, Percentiles, Normal	2nd DISTR normalcdf, InvNorm
13	9	Markov chains	2nd MATRIX MATH rref(, identity(
14	9	no instructions	

TI–83 Lab 1 For Statistics 213

Topics: on and off, graphing functions, making tables for functions, evaluating a function, intersection of functions, lists, linear regression

Dataset: "showerhead", a dataset of the maximum flow rates for 34 different shower heads:

2.9 2.8 2.0 3.6 2.7 2.5 2.6 2.9 2.7 2.8 2.5 2.8 2.2 2.5 2.5 2.8 1.8 2.7 2.7 4.7 2.8 2.7 3.1 2.9 3.4 2.6 2.6 2.7 2.4 2.5 5.4 4.9 2.8 2.5

"pizza.dat" a table of the student population (x, in 1000's) versus the annual sales (y, in \$1000's) of Armand's pizzas

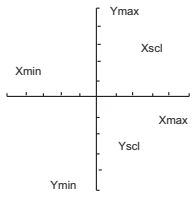
number students, x	2	6	8	8	12	16	20	20	22	26
pizza sales, y	58	105	88	118	117	137	157	169	149	202

On and Off. In this exercise we will learn how to turn your calculator ON and OFF.

- Turn on the calculator by pressing the ON button, a black button on the lower left of the calculator. You are at the MAIN screen.
- Turn off your calculator by pushing "2nd", a yellow button in the upper left corner, followed by ON.

Graphing Functions.

- *Setting Up The Window: Identifying The Part Of The Graph We Want To See.* We first want to set the various parameters, most of which are given in the figure below, which define the *window* on the Cartesian coordinate system.



  - Push WINDOW. The WINDOW button is second from the left in the row of blue buttons just below the calculator screen.
  - Set the various parameter values as follows: Xmin = -4, Xmax = 4, Xscl = 1, Ymin = -10, Ymax = 10, Yscl = 1, Xres = 1.
  - The last parameter, Xres, sets the pixel resolution (1 through 8); at highest resolution 1, functions are drawn on every pixel.

– To exit WINDOW, type 2nd MODE; in other words, QUIT.

- *Typing and Graphing A Linear Function.* Next, we want to graph $y = 2x + 3$. Push "Y =". The "Y =" button is first from the left in the row of blue buttons just below the calculator screen. Opposite "Y_1 =", type

  – 2 "X,T,θ,n" + 3

  Now type GRAPH. The GRAPH button is first from the *right* in the row of blue buttons just below the calculator screen. The calculator should now graph the line $y = 2x + 3$.

- *Typing and Graphing A Nonlinear Function.* To graph $y = -2x^2 + 2x - 2$, push "Y =". Opposite "Y_2 =", type

  – (-) 2 "X,T,θ,n" x^2 + 2 "X,T,θ,n" - 2

  (Use *grey* button "(−)", rather than blue button "−".) Now type GRAPH. The calculator should now graph $y = -2x^2 + 2x - 2$ on the same graph where $y = 2x + 3$ appears.

- *Typing and Graphing The Function $x = 1$.* To graph $x = 1$ *approximately*, push "Y =". Opposite "Y_3 =", type

  – 9999 ("X,T,θ,n" – 1 2)

  Now type GRAPH. The calculator should now graph $x = 1$ on the same graph where the first two functions appear.

- *Choosing Which Function(s) To View.* To *only* see $y = -2x^2 + 2x - 2$ on the graph, push "Y =", then push the blue left "arrow" *back* to the black "=" sign opposite $y = 2x + 3$ and press ENTER to *un*black this sign. Press GRAPH and only $y = -2x^2 + 2x - 2$ should now appear. To view both functions again, black in the "=" sign opposite $y = 2x + 3$ by arrowing to it and pressing ENTER.

- *Evaluating A Function.* Press TRACE, the blue button, second from the right under the calculator screen. Both functions appear, but, in addition, a blinking box appears on the graph of the $y = 2x + 3$ function. As well, $y = 2x + 3$, $x = 0$ and $y = 3$ appear in the upper left, lower left and lower middle of the calculator screen, respectively. By pushing the right blue arrow, the blinking box moves right along the $y = 2x + 3$ line and (x, y) change accordingly, to, for example, $x = 0.17\ldots$ and $y = 3.34\ldots$. By pushing the *down* blue arrow, the blinking box hops down to the $y = -2x^2 + 2x - 2$ function.

Making Tables For Functions.

- *Setting Up The Table: Identifying The Part of the Function You Want To See In The Table.* Make sure the two functions, $y = 3x + 3$, and $y = -2x^2 + 2x - 2$, are typed into "Y =". Then push the button TBLSET: push yellow button "2nd", followed by blue button "WINDOW", which is the second button from the left under the calculator screen.
  - Set the parameters as TblStart = $(-)10$, ΔTbl = 1, Indpnt: Auto and Depend: Auto.
- *Viewing The Table.*
  - Press TABLE: push "2nd", followed by GRAPH. A table will appear with x in the first column, starting at -10, then -9 and so on. Corresponding values of the linear and nonlinear function appear in the second and third columns.

Evaluation of a Function. We will evaluate the function, $f(x) = 3x^4 + 8x^3 - 90x^2 + 4$, at $x = -1, 0, 23$

1. Type the function $f(x) = 3x^4 + 8x^3 - 90x^2 + 4$ into "Y =". Then 2nd QUIT.
2. To evaluate this function at $x = -1$, type

   VAR Y–VAR ENTER ENTER (-1) ENTER

   The calculator should return -91.
3. In a similar way, the calculator should return 4 and 889253 for $x = 0$ and $x = 23$, respectively.

Intersection of Two Functions.

1. We will use the calculator to find the intersection of the two functions, $y = 150 + 32x - 12x^2$ and $y = 75 + 100x - 20x^2$.
2. Set the various parameter values of the window of the TI–83 calculator as follows: Xmin = 0, Xmax = 6, Xscl = 1, Ymin = -50, Ymax = 250, Yscl = 25, Xres = 1.
3. Next, we want type in the function. Push "Y =". Now type
   - (for Y_1) 150 + 32 "X,T,θ,n" − 12 "X,T,θ,n" x^2
   - (for Y_2) 75 + 100 "X,T,θ,n" − 20 "X,T,θ,n" x^2

4. Next, we want to graph both functions. Type GRAPH.

5. To find the intersection for these two functions, type "2nd TRACE" (or, in other words, CALC), then choose "2:zero", followed by ENTER.

   - In response to "First Curve?", with the blinking box on one of the two functions, press ENTER.
   - In response to "Second Curve?", with the blinking box on the other of the two functions, press ENTER.
   - In response to "Guess?", move the blinking box along the one function to as close as possible to the point where the two function cross one another and then press ENTER.
   - The calculator then returns the answer, $X = 1.303$, and $Y = 171.32$.

Lists. In this exercise, you will type the 34 maximum flow rates into list L_1 of the calculator.

- Push the STAT button, a black button two over from the green ALPHA button. A screen appears which has EDIT and 1: highlighted. This is what you want.
- Push ENTER, a blue button on the lower right of the calculator. A screen appears which has three lists (columns) entitled L1, L2 and L3. At the bottom left of the screen is L1(1) = . The first position on the first list is highlighted by a dark square called the cursor.
- Type in the first data point, 2.9, then ENTER. The number "2.9" is in the first position and the highlighted square now appears *below* this position of the first list. Type in the second data point, 2.8, then ENTER. Continue this until all 34 numbers have been entered in L1.
- If you have used the calculator before, there may be numbers in this list–you should clear this numbers. You do this by pushing the blue up triangle, $\triangle$, then CLEAR (a black button just below the four triangle buttons), then ENTER.

Linear Regression. Use Armand's Pizza Parlors data.

- Remember to turn off all the STAT PLOTs and Y = plots, and type the (x, y) values of "pizza.dat" into the (L_1, L_2) lists.
- To determine the linear regression, key in:
  - STAT CALC 8: LinReg(a + bx) ENTER 2nd L_1 , 2nd L_2

The calculator should return the linear regression $y = \mathrm{a} + \mathrm{b}x$, where the y–intercept is given by a= 60 and the slope is given by b= 5.

- Recall, to display the scatter plot, press,
  - 2nd STAT PLOT ENTER
  - On ENTER
  - Type: scatter plot figure first row, far left ENTER
  - Xlist: L1 (for x values) ENTER
  - Ylist: L2 (for y values) ENTER

  and then hitting ZOOM 9:ZoomStat. The TRACE key can be used to see the values of the various (x, y) points.

- To superimpose the linear regression line on the scatter plot,
  - Y= VARS 5:Statistics EQ ENTER GRAPH

  Again, the TRACE key can be used to see the values of the various (x, y) points.