Notes

Name KEY

Advanced Algebra (H) Quadratic Regression Using the TI - 83

Prior to beginning these problems, your calculator must be set up to plot points. In order to do this, push [y=] . Toggle up cursor ▲ to Plot 1. Push [ENTER] to get into Plot 1. Toggle down cursor ▼ . Push [2nd] [MODE.] Your screen should be clear.

Before plotting any points, be sure your WINDOW is appropriate for the data values. If, for example, you are plotting the points (-23, 84) (-20, 76) and (-26,76) having a window with a maximum of 10 and a minimum of - 10 will not show the plotted points. Be sure to always check what the values are set at. You can do this by pushing the key marked WINDOW.

Finally, be sure that there are no equations stored in y_1 before doing each problem.

OK.....now that we have those technical things taken care of .... let's do some mathematics.

SAMPLE PROBLEM

The data in the table below was published in the *Mesa (Arizona) Tribune* on August 8, 1993. It gives the amount of time needed to redden untanned skin at different times of the day based on the predicted weather for that day.

how put lists in calc.?

Time	9 am	10 am	11 am	noon	1 pm	2 pm	3 pm	4 pm
Minutes	34	20	15	13	14	18	32	60

1. What is an appropriate domain for your equation?

9, 10, 11, 12, 13, 14, 15, 16

2. What is an appropriate WINDOW setting? $X_{min} < 9$, $X_{max} > 16$

$Y_{min} < 13$, $Y_{max} > 60$

a. On the calculator, push [STAT]. Select [1] to edit. Now enter the data for the time in L_1 and the corresponding minutes into L_2.

b. Push GRAPH. You should see your data points plotted.

TO OBTAIN AN EQUATION AND GRAPH THE EQUATION

a. Push STAT, Cursor over to CALC, Push 5 {You should see QuadReg}

Push: 2nd 1 , 2nd 2 , Vars (cursor over to Y vars) 1

Enter

On the calculator screen you should see Quad Reg L_1, L_2, Y_1

Push Enter

$y = ax^2 + bx + c$

a = 2.8333

b = -67.8333

c = 416.0833

Write the quadratic equation you obtained: $y = 2.8\bar{3}x^2 - 67.83x + 416.083$

Your equation has been entered into Y_1. If you push GRAPH you should get the equation of the best fit quadratic.

To clear out the lists that you have in L_1 and L_2, cursor up so that L_1 is highlighted. Push CLEAR and then push ENTER. L_1 should be empty and you can do the same with L_2.

YOUR TURN:

The table below gives the minimum stopping distance (in feet) required to stop a car traveling at the given speed on dry pavement.

Speed (mi/hr)	10	20	30	40	50	60	70
Stopping Distance	19	42	73	116	173	248	343

checked

$y = 0.0724x^2 - 0.4905x + 19.743$

a. Set your WINDOW. Plot the data Points.

b. Find the equation that is the best fit for these points. _____

c. Change the WINDOW so that X - MAX = 100 and Y-Max = 500.

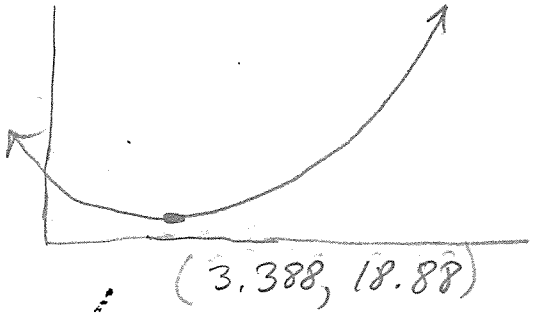
Turn Plot 1 Off. {To do this push [y=] Cursor up to Plot 1 and push [ENTER] Push [2nd] [MODE]

d. Push [GRAPH] Now all that is graphed is the equation without the plotted points. Push [TRACE] Using the graph, determine the stopping distance if you are traveling

65 mi./hr. 293.648 (x = 65, trace → 296.97) 80 mi./hr. 443.714 (442.535) 15 mi./hr. 28.64 (28.8) ← Using 2nd trace value

trace only

e. Sketch your graph.



2. *****SEE REFERENCE TABLE AT THE END OF THE PACKET TO ANSWER QUESTION B***

YOU MAY HAVE TO ADJUST YOUR WINDOW A FEW TIMES WHILE DOING THIS PROBLEM.....JUST DO IT!!!!!

An object was projected upward and the following data collected.

Time in Seconds (t)	1	2	3	4	5	6
Height in Meters (h)	120.1	205.4	280.9	346.6	402.4	448.4

a. Write the specific equation relating time and height for this object.

$y_1 = -4.916x^2 + 100.075x + 24.930$

b. What was the initial height? The initial velocity? initial velocity 24.93 m, 100.08
(See Reference Information)

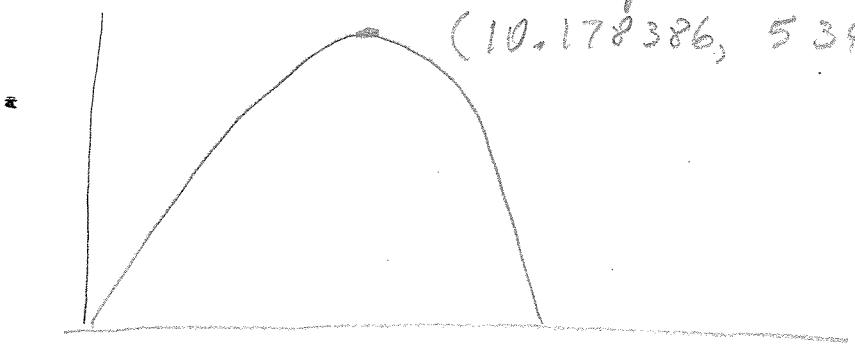
c. At what time did the object reach its maximum height? after ≈ 10 secs.

d. What was the maximum height? 534 m

e. When was the object 300 m high? 17.08 s, 3.27 s use Quad Form.

f. When did the object hit the ground? ≈ 20.6 sec.

g. Sketch Graph: label at least 1 point.



3. The data in the table represents the amount of water in a draining bathtub and the amount of time since the plug was pulled.

Y	Amount of Water (L)	38.4	30.0	19.6	7.2
X	Time (Min)	1	1.5	2	2.5

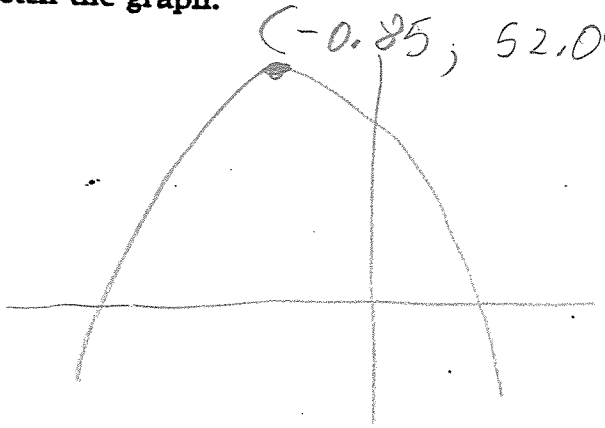
a. Write an equation expressing liters (L), in terms of time (t).

$Y = -4X^2 - 6.8X + 49.2$

b. How much water was in the tub when you pulled the plug? 49.26 ∴ (t=0)

c. How long did it take the tub to empty? ≈ 2.76 min.

d. Sketch the graph:



max/min prob.

4. The local discount store charges $6.60 for a flashlight. On the average, 200 of them are sold each day. A survey indicates that the sales will decrease by an average of 10 flashlights per day for each 50-cent increase in price. Find the maximum price that will obtain the maximum profit.

a. Solve the problem algebraically. Find the maximum price that will obtain the maximum profit. Let X = increment of change

$= \$8.30$

$$M(X) = (6.6 + .50X)(200 - 10X)$$

$$M(X) = 1320 + 34X - 5X^2$$

$$= -5X^2 + 34X + 1320$$

$$X = \frac{-34}{2(-5)} = 3.4 \qquad M(3.4) = (8.3)(166)$$

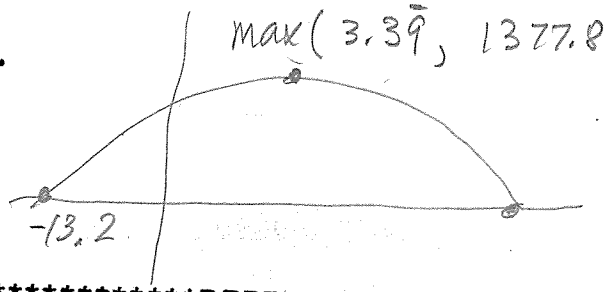
(Max profit = $1377.80)

b. Enter your ORIGINAL equation {that is, the equation you have BEFORE you complete the square} in your calculator: $y_1 =$

Graph your equation. SKETCH GRAPH BELOW.

Check to see the maximum price and maximum profit are the same as above.

GRAPH:



Yes, the same.

**********REFERENCE TABLE**********

PROJECTILE MOTION EQUATION $h = at^2 + vt + s$

Height versus time: $y = ax^2 + v_0x + s_0$, where

y = height in meters (feet), a = -4.9 m/sec^2 or -16 ft/sec^2

x = time in seconds, v_0 = initial speed in m/sec or ft/sec

s_0 = initial height in meters or feet.

easier: feet: $h = -16t^2 + vt + s$

meters: $h = -4.9t^2 + vt + s$

} Must memorize for test (not given)

meters formula/EQ

max/min prob,

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a. Solve the problem algebraically. Find the maximum price that will obtain the maximum profit.

$M(x) = (6.6 + .50x)(200 - 10x)$

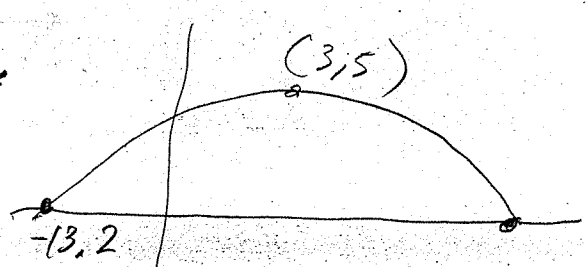
= 88.30

b. Enter your ORIGINAL equation {that is, the equation you have BEFORE you complete the square} in your calculator: $y_1 =$

Graph your equation. SKETCH GRAPH BELOW.

Check to see the maximum price and maximum profit are the same as above.

GRAPH:



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