

Student Notes

1. Open the CalcMaxMin 2 file in the calculus folder by pressing menu $\langle 7 \rangle$. Scroll to find the file and press enter . See Figure 1.

2. Press ctrl \blacktriangleright to move to page 1.2. See Figure 2.

Construct a segment CS where S is a point near the middle of BA.

Press menu $\langle 6 \rangle$ $\langle 5 \rangle$. Place the \blacktriangleright on point C and enter . Use the arrows to draw a segment to BA. Press enter caps $\langle S \rangle$ to label the point on BA before leaving the menu and esc .

Use the procedure above to construct segments BS and SA.

3. Measure BS and SA.

Press menu $\langle 7 \rangle$ $\langle 1 \rangle$ and move \blacktriangleright until segment SA flashes and enter enter . Move \blacktriangleright to BS and repeat the process and esc . See Figure 3. Move the measurements for BS and SA below the drawing and above “4mi”.

4. Label the lengths BS, SA, and BC as such.

Place \blacktriangleright on the measurement for BS and enter . Press stor var $\langle 1 \rangle$. Hold down caps while pressing B $\langle S \rangle$ enter . Repeat the process for SA and BC. With BC flashing press ctrl enter and move the value to the left of segment BC. See Figure 4.

5. Use “text” to label CS and SA with $d = \text{CS}$ and $x = \text{SA}$.

Place \blacktriangleright near segment CS and press menu $\langle 1 \rangle$ $\langle 6 \rangle$ enter D enter . Move the d if necessary. Repeat the procedure for x and esc . See Figure 5

6. Press ctrl \blacktriangleright to move to page 1.7. After writing an equation press ctrl \blacktriangleright to move to page 1.8. To reveal the answer press tab until the up arrow to the right of Answer is highlighted. Move to page 1.9.

7. Type the formula for CS.

Place \blacktriangleright in the left middle of the screen. Use text, menu $\langle 1 \rangle$ $\langle 6 \rangle$, and type the formula for CS and press enter and esc .

8. Calculate the current value of CS and assign a variable to the value.

a. To calculate the current value place \blacktriangleright on CS until the segment flashes. Press menu $\langle 7 \rangle$ $\langle 1 \rangle$ enter enter esc . Move the value below the formula for CS and esc .

b. To assign a variable to CS place \blacktriangleright on the value for CS. Press enter stor var $\langle 1 \rangle$ and type D enter and esc . See Figure 6. Move to page 1.10. Follow instructions on 1.11.

9. To calculate the total cost using the current values press menu $\langle 1 \rangle$ $\langle 8 \rangle$. Move \blacktriangleright to the cost equation until it flashes. Press enter . Move \blacktriangleright to the value for d and value flashes. See Figure 7. Press enter . Again you will get a text box asking you to select a value for x. Move \blacktriangleright to the value for SA (Rem: $x = \text{SA}$). Press enter . Move the \blacktriangleright off SA and a number will follow you. This is the cost for the given values of d and x. Move the value under the cost equation and press enter esc . See Figure 8.

10. Assign a variable to the cost value.

Place \blacktriangleright on the value until the hand appears and the number flashes. Press ctrl stop Var 1 and type T C and press enter esc . See Figure 9.

11. Press ctrl \blacktriangleright to see a Lists and Spreadsheet page with headings for land, water, and totalcost. We are now ready to collect data for our spreadsheet. Press ctrl \blacktriangleleft to return to the Graphs and Geometry page. Grab point S (ctrl S) and move it to the right until SA = 0. See Figure 10. Press ctrl . to set the first point in the spreadsheet. Press ctrl \blacktriangleright . See Figure 11.

Note: The value for d is 4.12311 or $\sqrt{17}$ as it should be if we traveled by water only.

12. Press ctrl \blacktriangleleft to return to the previous page. Place the cursor \blacktriangleright on Point S. Press ctrl C to get a closed hand. Move the closed hand to the left a few clicks (I use 4.) and press ctrl . . Continue this process until Point S lies on top of Point B. Press ctrl . one last time and esc . See Figure 12

13. Press ctrl \blacktriangleright to look at the spreadsheet.
Note: The last value in the spreadsheet should be sa = 4, d = 1, and tc = 17000 which represents the distance traveled along the legs of the triangle.

Note: ctrl G will allow you to move to any row in the spreadsheet. Press ctrl G 1 and enter to move to Row 1 in the spreadsheet.

14. Press ctrl \blacktriangleright to see a Graphs and Geometry page that has been set up as a Scatter Plot.

You will need to set the window to enable you to see the data collected.

Press menu 2 8 to show axes end values.

Place the cursor \blacktriangleright on the y-min and press

2nd 2nd . Press 2nd tab which carries you to the y-max. Type 2 2 0 0 0 and tab to x-max. Type 6 and tab to y-min and type 1 0 0 0 0 and tab and esc esc .

See Figure 13.

15. Before proceeding copy the graph to a new problem.

Press ctrl fn 4 to insert a new problem.

Press 2 to open a Graph page. To copy

press ctrl \blacktriangleup to go to the Page Sorter. With

the border around the graph page press

ctrl C . Press \blacktriangledown \blacktriangledown so the border is around

the new problem. Press ctrl V to paste page into problem 3. Place border around 3.1 and

press clear .

16. Find a quadratic function that best fits the data. Press ctrl \blacktriangleleft until you get to the first graph page.

Change the Graph Type from Scatter Plot to

Function by pressing menu 3 1 . Press

ctrl \blacktriangleleft to return to the Lists and Spreadsheet page.

Place your \blacktriangleright in column D. Press menu 4 1

6 to get a Quadratic Regression. Select

“water” from the X List and “totalcost”

from the Y List. Press enter to get your

Regression Model. See Figure 14. Press

ctrl \blacktriangleright to return to graph. Press ctrl G to see

the equation. Press \blacktriangleup and enter to see the

graph of the quadratic model. See Figure 15.

17. Since I cannot trace on a Regression Model

type 4 0 1 X 2nd 2nd

5 7 8 X + 1 6 4 5 2

into problem 3.1 as f1(x) and enter . Press

menu 5 1 to trace and approximate the

minimum value. See Figure 16.

This is an unreasonable answer since it is 1 mile to shore. Therefore we will grab our graph near the vertex and move the parabola until the vertex is near the lowest point of the stat graph. Also grab the parabola near the top of the screen and work for a better fit. Find the minimum point now. See Figure 17.

18. Write an equation for total cost in terms of x to find the actual minimum value.

The equation is

$$tc = 5000\sqrt{1 + (4 - x)^2} + 3000x.$$

Insert a new problem (Problem 4).

On page 4.1 press $\text{(menu)} \quad \text{2}$ to get a Graphs and Geometry Page. Use the same window as in Step 14 and type the equation into $f1(x)$ and ENTER . Find the minimum value of this function by pressing $\text{(menu)} \quad \text{5}$ 1 and trace until the minimum appears. See Figure 18.

Note: The x value of the ordered pair in Figure 17 represents the distance traveled by water. When solved, the value for x is 3.13 which is under by 0.12 mi while the minimum value is under by \$1.90.

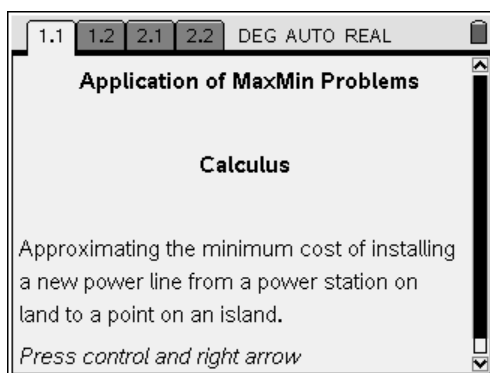


Figure 1

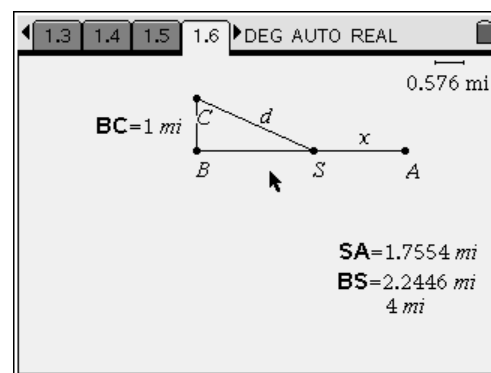


Figure 5

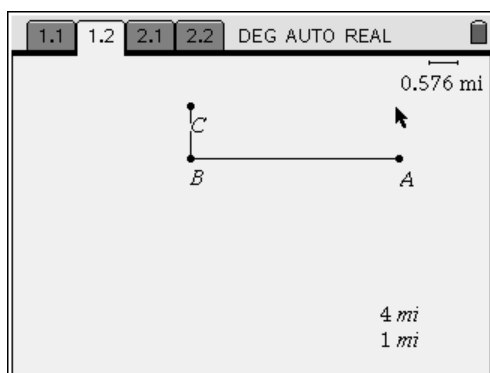


Figure 2

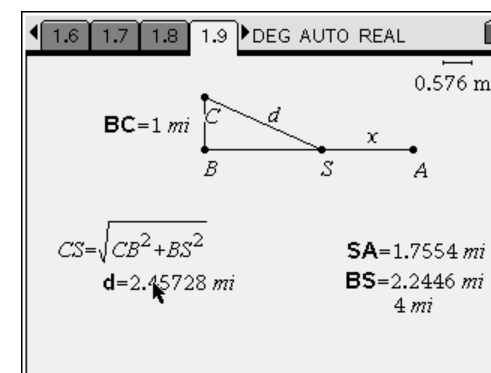


Figure 6

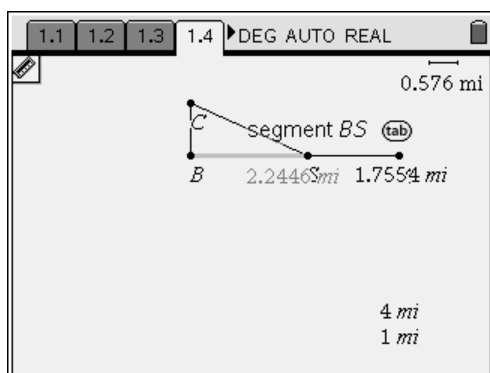


Figure 3

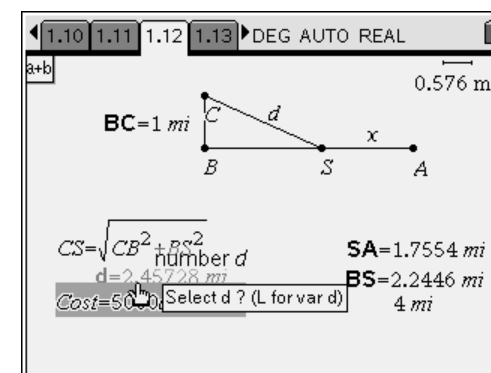


Figure 7

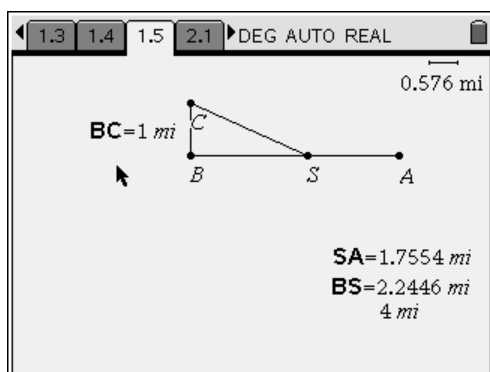


Figure 4

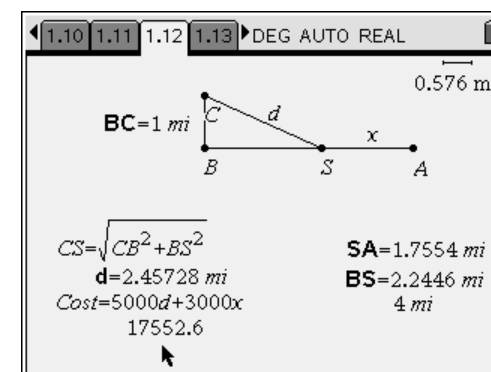


Figure 8

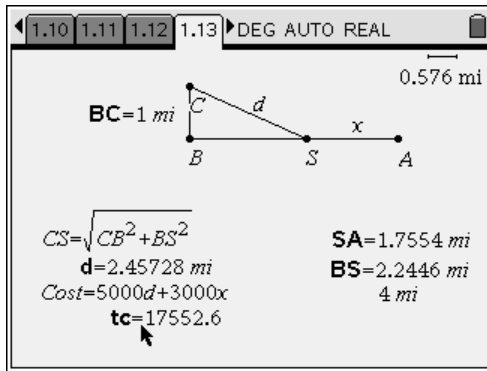


Figure 9

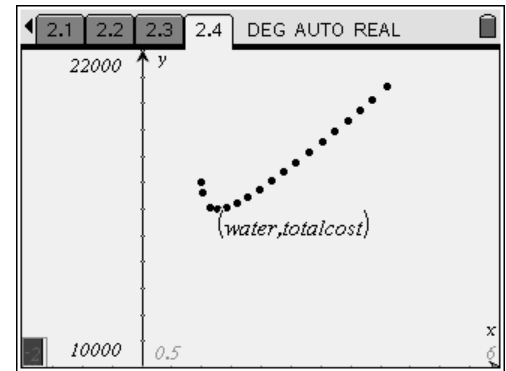


Figure 13

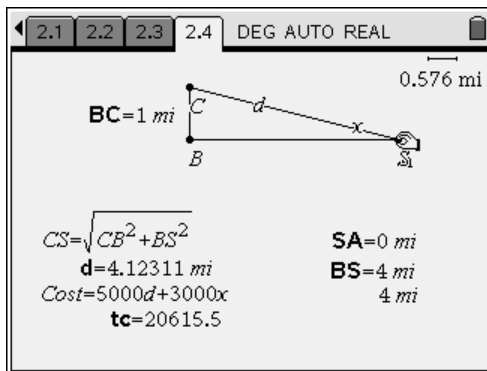


Figure 10

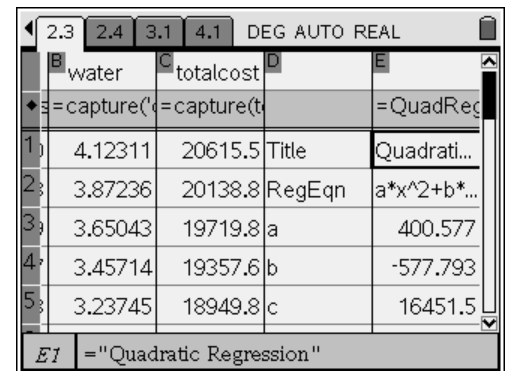


Figure 14

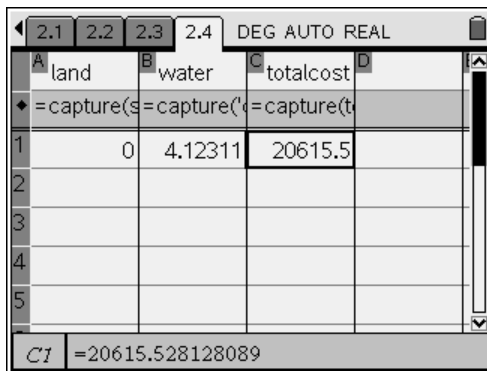


Figure 11

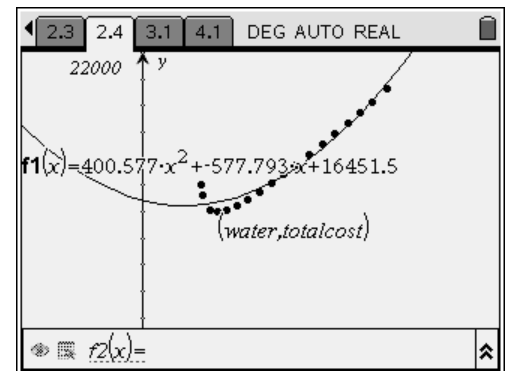


Figure 15

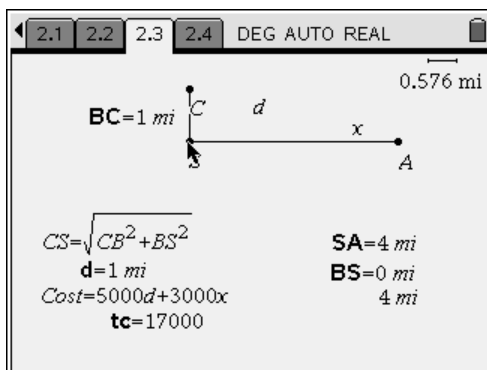


Figure 12

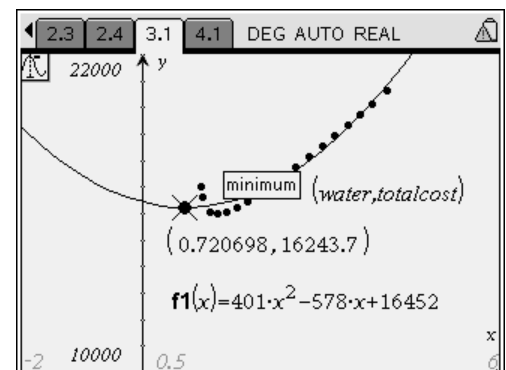


Figure 16

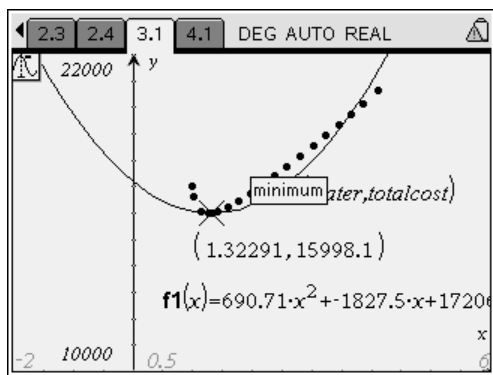


Figure 17

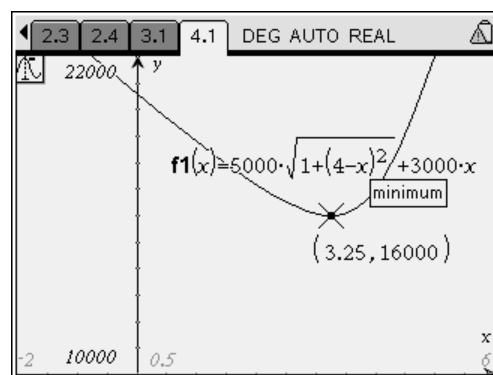


Figure 18