# Step-by-Step Instructions

This investigation guides the students through using a piecewise function to model an electric bill.

1. Download the electric bill tns. document and link to student calculators. Note: The teacher version is electric bill SOL: it includes completed calculations, functions, graphs and tables.
2. Distribute the student worksheet. Information from an electric bill is included on the worksheet in the same form it appears on an actual bill, with working space provided.
3. The nspire document allows students to investigate each "piece" of the piecewise function for a thorough understanding.
4. The instructor should make certain students understand the difference between Total Energy Charge (DOES NOT include resource adjustment and state sales tax) and Total Charge This Service Agreement (Includes resource agreement and State sales tax).

The Electric Bill student worksheet will be distributed and students will work through the first page of the worksheet and then work in conjunction with the student nspire document.

Problem 1- Using calculation application
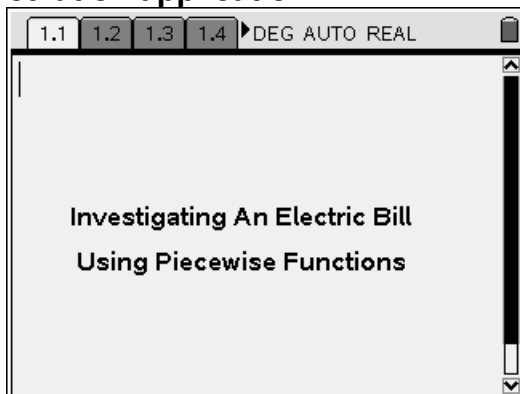
Page 2

Students will refer to the information regarding readings of an electric bill and use the calculator at the lower split screen to determine he number of kilowatts used over the period indicated.	
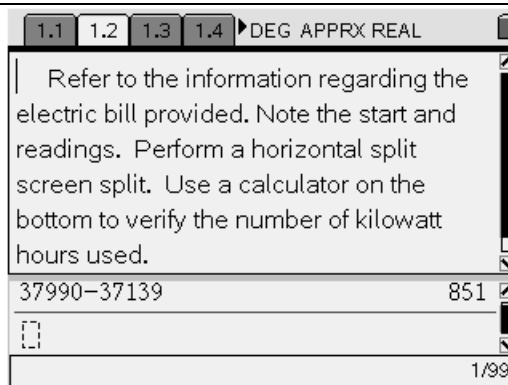
Page 3

Students are given the rate information regarding the number of kilowatts used and also other adjustment charges. Rates will vary depending on electric company and part of the country students reside in. This page will have to be edited if students bring in their own electric bill and work from it rather than this example.	1.1 1.2 1.3 1.4 ▶DEG AUTO REAL Note the following rates for kilowatts used in a billing period: 5.00 for first 50 kwh or less .04773 per kwh for next 300 kwh .07218 per kwh for over 350 kwh .0001 per kwh AREA adjustment Resource adjustment is 29.82 % total Add 6.5% of total amount to ≈ bill charge

Page 4   **Page 5**

This page is optional, the teacher can use at their own discretion. It can be used if the teacher wants the students to look at each piece in a split screen with a geometry page and table to study each piece of the function. (ctrl) , (I) to insert new page (2) to select graph & geometry, enter function piece and graph. (menu) , (2) , (8) to add function table **Page 5** of solution document at right.	1.2 1.3 1.4 1.5 ▶DEG APPRX REAL $f2(x)=\{5, 0 \le x \le 50$ 20 y, 2, -10 10 100 f5(x)= x | f2(x):.. ▼ piecewi 15. | 5. 48. | 5. 80. | #UNDE 5.

Page 6   **Page 7**

|	
1.4 1.5 1.6 1.7 ▶DEG APPRX REAL 50 y $f3(x)=\{5+.04774 \cdot (x-50), 50 \le$ 5 f5(x)= x | f3(x):.. ▼ piecewi 55. | 5.238 200. | 12.16 325. | 18.12 500. | #UNDE .	1.4 1.5 1.6 1.7 ▶DEG APPRX REAL 100 y $f4(x)=\{19.32+.07219 \cdot (x-35$ 200 1000 f5(x)= x | f4(x):.. ▼ piecewi 400. | 22.93 500. | 30.149 900. | 59.025 1200. | 80.682

Page 8	**Page 9**
This page instructs the student to insert a calculator page to define a piecewise function. (ctrl) (I) insert a new page (menu)(enter) to select calculator application (📋)(D)▼ scroll down to Define, (enter) , (F),(⟨⟩),(X) , (⟨⟩) , = (ctrl),(▒), (▶) eight times to get the piecewise function template, select 3 for the number of function pieces Enter each function and domain, using (tab) to move to next entry, press (enter) Page 9 shows result.	
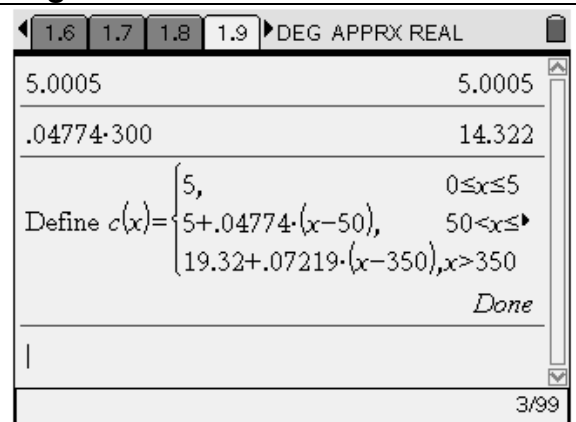
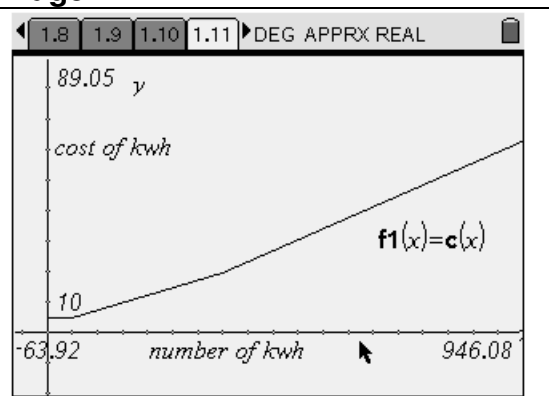| **Page 10**	**Page 11**
The student is instructed to insert a graph and geometry page, trace and investigate the charge for different kwh usages. It is noted that these charges <u>do not</u> represent the **total bill,** as resource adjustment and state sales tax are not represented by the function c(x). Page 11 shows the resulting graph.	

During the tracing is a good time to enter a point and demonstrate to the students how they can highlight the x coordinate, press (enter) twice and then edit the x coordinate and press (enter) and observe how the point moves to that x coordinate and shows the new corresponding y-coordinate. Demonstrate that the y-coordinate can be highlighted and changed in the same manner to determine the number of kwh used to result in that cost. It should lead to interesting discussion regarding trying to use a certain number of kwh to stay within a budget. This investigation leads to the activity title, "Turn Off The Extra Lights?"

Page 12

Use a calculator page and function notation to determine the cost of 125, 235, 350, 490,850,and 1100 kwh.

$c(850)$ 55.415

$c(1100)$ 73.4625

Page 13

Determine the total charge of 851 kwh, including resource adjustment (29.82%) and sales tax(6.5%) on the sum.

$c(851)+.2982 \cdot c(851)$ 72.033

$72.033+.065 \cdot 72.033$ 76.715

The above two pages provide the answer for pages 1.8 and 1.9 in the student document.

Pages 1.14 and 1.16 that follow show question and answer pages and 1.17 requests the student to show the work in terms of function notation for calculating the total charge for the use of 1248 kwh in a billing period.

Page 14

Question

What was the total charge for this service during the billing period?

Answer ⌄⌄

The total charge was $76.72 for the billing period.

Page 15

Complete a horizontal split on this page and use a calculator application to show total charge of this agreement if 1248 kwh were used in the billing period.

$c(1248)+.2982 \cdot c(1248)$ 109.24

$109.24+.065 \cdot 109.239142084$ 116.34

Page 16

Question

Did this nspire activity assist you in developing a better understanding of piecewise functions? Explain.

Answer ⌄⌄

Students should be instructed to answer questions in complete sentences.

Turn Off The Extra Lights ?
(Student) TI-Nspire File