Name: Katie[redacted]

Date: 09/09/24

Instructor: Samuel Chukwuemeka

Project: Residential Power Bill Rates

Company: Alabama Power Company

Website: https://www.alabamapower.com/content/dam/alabama-power/pdfs-docs/Rates/FD.pdf

Objectives:

(1.) Calculate the winter power bill of the residents of Alabama within each range of specific water usage manually using Arithmetic method.

(2.) Write a piecewise function of the residential rates.

(3.) Recalculate the same power bill of the residents of Alabama within each range of specific power usage algebraically using the Piecewise Function method.

Information:

Base Charge**:** $14.50 per customer; plus

BILLING MONTHS OCTOBER – MAY

Charge for Energy:

12.4384¢ per kWh for the first 750 kWh, plus

11.2384¢ per kWh for all over 750 kWh.

Conversions:

$$12.4384¢ = \frac{\$12.4384}{100} = \$0.124384\ per\ KWh$$

$$11.2384¢ = \frac{\$11.2384}{100} = \$0.112384\ per\ KWh$$

Numbers kWh to be tested:

I will test the following utilization of kWh:

(1) 0 kWh

(2) 300 kWh

(3) 1000 kWh

Arithmetic method:

(1.) For the utilization of 0 kWh:

$Cost = \$14.50$

(2.) 300 kWh

$Cost = 14.50 + 0.124384(300)$

$Cost = 14.50 + 37.3152$

$Cost = 51.8152$

$Cost \cong \$51.82$

(3.) 1000 kWh

$Cost = 14.50 + 0.124384(750) + 0.112384(1000 - 750)$

$$Cost = 14.50 + 93.288 + 0.112384(250)$$

$$Cost = 14.50 + 93.288 + 28.096$$

$$Cost = 135.884$$

$$Cost \cong \$135.88$$

Piecewise Function:

Let us define variables:

Let k be the power consumed in kWh

$e(k)$ is the cost per consumption of power in $

Base Charge**:** $14.50 per customer; plus

First piece: First 750 kWh: $0 \leq k \leq 750$

$$e(k) = 14.50 + 0.124384k$$

$$e(k) = 0.124384k + 14.50$$

Second piece: Over 750 kWh: $0 > k > 750$

$e(k) = 14.50 + 0.124384(750) + 0.112384(k - 750)$

$e(k) = 14.50 + 93.288 + 0.112384k - 84.288$

$e(k) = 0.112384k + 23.5$

Piecewise Function

$$e(k) = \begin{cases} 0.124384k + 14.50; & 0 \leq k \leq 750 \\ 0.112384k + 23.5; & k > 750 \end{cases}$$

Piecewise Function (Algebraic Method):

I will test the same numbers I used with the Arithmetic Method.

(1.) For the utilization of 0 kWh:

0 kWh falls in the first piece

$e(k) = 0.124384k + 14.50$

$e(0) = 0.124384(0) + 14.50$

$e(0) = 0 + 14.50$

$e(0) = \$14.50$

(2.) For the utilization of 300 kWh:

300 kWh falls in the second piece

$e(k) = 0.124384k + 14.50$

$e(300) = 0.124384(300) + 14.50$

$e(300) = 37.3152 + 14.50$

$e(300) = 51.8152$

$e(300) \cong \$51.82$

(3.) For the utilization of 1000 kWh:

1000 kWh falls in the third piece

$e(k) = 0.112384k + 23.5$

$e(1000) = 0.112384(1000) + 23.5$

$e(1000) = 112.384 + 23.5$

$e(1000) = 135.884$

$e(1000) \cong \$135.88$

Reference (MLA)

Chukwuemeka, Samuel. “Piecewise Function Application: Power Bill.” *Appspot.com*, 2018, https://conferencepresentations.appspot.com/Projects/PreCalculus/PiecewiseFunctions/PowerBill.html. Accessed 19 Sept. 2024

RATE FD FAMILY DWELLING- RESIDENTIAL SERVICE in Docket # 24860. The KWh Charges Shown Reflect Adjustment pursuant to Rates RSE and CNP for Application to Monthly Bills Effective for June 2023 Billings. PAGE 1 of 2 EFFECTIVE DATE. 2008 from https://www.alabamapower.com/content/dam/. Accessed 19 Sept. 2024