1. **Problem**

The rate at which an office building consumes energy (in kilowatt-hours(KWh) per week) is approximated by $f(t) = 32.614e^{0.7216t}$, where t is in weeks since February 4, 2020. Energy consumption costs 12 cents per kilowatt-hour.

Use three digit accuracy in all computations.

Select each of the true statements from the following:

(a) The rate at which energy is consumed 3 weeks after February 4, 2020 is $f(3)$.

(b) The rate at which energy is consumed 5 weeks after February 4, 2020 is $f(5)$.

(c) The total amount of energy used by the office building during the 2 weeks after February 4, 2020 is $\int_0^4 f(t)dt$.

(d) An antiderivative of $f(t) = 32.614e^{0.7216t}$ is $F(t) = 32.614e^{0.7216t}$

(e) $\int_0^2 f(t)dt = 32.614e^{0.7216(2)} - 32.614e^{0.7216(0)}$

(f) The total amount of energy used by the office building during the 4 weeks after February 4, 2020 is 810.317 KWh.

(g) The energy cost for the office building during the 2 weeks after February 4, 2020 is \$22.96.

(h) All of the above statements are false.

Solution

(a) True. The rate at which energy is consumed 3 weeks after February 4, 2020 is $f(3) = 284.161$ KWh per week.

(b) True. The rate at which energy is consumed 5 weeks after February 4, 2020 is $f(5) = 1203.202$ KWh per week.

(c) False. The total amount of energy used by the office building during the 2 weeks after February 4, 2020 is

$$\int_0^2 32.614e^{0.7216t}dt = \frac{32.614}{0.7216}e^{0.7216(2)} - \frac{32.614}{0.7216}e^{0.7216(0)} = 146.177$$

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(d) False. An antiderivative of $f(t) = 32.614e^{0.7216t}$ is $F(t) = \frac{32.614}{0.7216}e^{0.7216t} = 45.197e^{0.7216t}$

(e) False.

$$\int_0^2 f(t)dt = \int_0^2 32.614e^{0.7216t}dt = \frac{32.614}{0.7216}e^{0.7216(2)} - \frac{32.614}{0.7216}e^{0.7216(0)}$$

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(f) False. The total amount of energy used by the office building during the 4 weeks after February 4, 2020 is

$$\int_0^4 32.614e^{0.7216t}dt = \frac{32.614}{0.7216}e^{0.7216(4)} - \frac{32.614}{0.7216}e^{0.7216(0)} = 765.121 \text{ KWh}$$

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(g) False. The total amount of energy used by the office building during the 2 weeks after February 4, 2020 is

$$\int_0^2 32.614e^{0.7216t}dt = \frac{32.614}{0.7216}e^{0.7216(2)} - \frac{32.614}{0.7216}e^{0.7216(0)} = 146.177 \text{ KWh}$$

To find the energy cost during this period of time we simply multiply this total amount of energy by 0.12 dollars per KWh to get \$17.54

(h) False.