Question

The relationship of a capacitor voltage (volts) and time (seconds) is given by $V = 95(1 - e^{0.1t})$.

1. Plot the graph between $t = 0$ and $t = 50$ at 10 intervals.
2. Find the differentiation value at $t = 10$. Use calculus to verify your solution.

Solution

1.

t, sec	0	5	10	15	20	25	30	35	40	45	50
U, volts	0	-61.63	-163.24	-330.76	-606.96	-1062.34	-1813.13	-3050.97	-5091.82	-8456.63	-14004.25

2. To differentiate $V = 95(1 - e^{0.1t})$, we need to use the following rules:
1. $f'(ax) = af'(x)$;
2. $(f(x) \pm g(x))' = f'(x) \pm g'(x)$;
3. $(f(g(x)))' = f'(g(x)) \cdot g'(x)$;
Therefore,
$$V'(t) = (95(1 - e^{0.1t}))' = 95 \cdot (1 - e^{0.1t})' = 95 \cdot (0 - (e^{0.1t})') = -95e^{0.1t} \cdot 0.1 = -9.5e^{0.1t}.$$
Thus, at $t = 10$
$$V'(10) = -9.5e^{0.1 \cdot 10} = -9.5e = -25.82.$$
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