ODEs: Applications of Separable Equations

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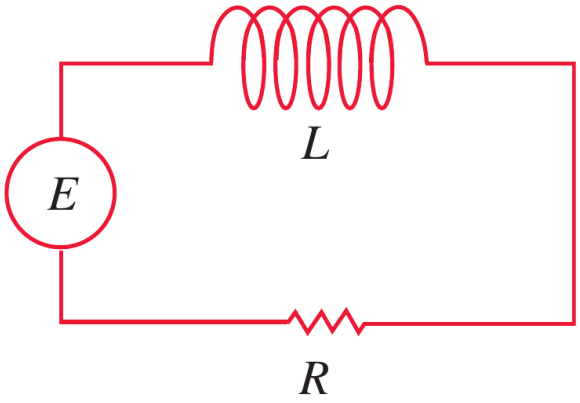
March 5, 2024

Example-7 LR**-Series Circuit** (p-78, DGZ)

Kirchhoff's second law states that the sum of the voltage drop across the inductor $(L(di/dt))$ and the voltage drop across the resistor (iR) is the same as the impressed voltage $(E(t))$ on the circuit as shown in the figure below.

A 12-volt battery is connected to an LR-series circuit in which the inductance is 12 *henry* and the resistance is 10 *ohms*. Determine the current i if the initial current is zero.



Example-2 LR**-Series Circuit** (p-29, EK)

Kirchhoff's second law states that the sum of the voltage drop across the inductor $(L(di/dt))$ and the voltage drop across the resistor (iR) is the same as the impressed voltage $(E(t))$ on the circuit as shown in the figure below.

Model the RL-circuit in figure above and solve the resulting ODE for the current $i(t)$ A (amperes), where t is time. Assume that the circuit contains as an EMF $E(t)$ (electromotive force) a battery of $E = 48$ V (volts), which is constant, a resistor of $R = 11\ \Omega$ (ohms), and an inductor of $L = 0.1\ H$ (henrys), and that the current is initially zero.

Example-3 Hormone Level (p-30, EK)

Assume that the level of a certain hormone in the blood of a patient varies with time. Suppose that the time rate of change is the difference between a sinusoidal input of a 24-hour period from the thyroid gland and a continuous removal rate proportional to the level present. Set up a model for the hormone level in the blood and find its general solution. Find the particular solution satisfying a suitable initial condition.

NOTE:

The students may be asked to solve a developed model with any method of instructor's choice.