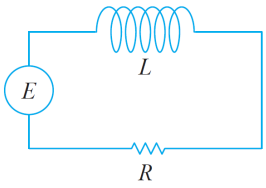
QUIZ 3 - MATH 310 Friday, September 12

YOUR NAME:_____ George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1.



LR-series circuit

For a series circuit containing only a resistor and an inductor, **Kirchhoff's second law** states that the sum of the voltage drop across the inductor $L\frac{di}{dt}$ and the voltage drop across the resistor iR is the same as the impressed voltage $E(t)$ on the circuit. Thus we obtain the linear differential equation for the current i(t),

$$L\frac{di}{dt} + Ri = E(t),$$

where L and R are constants known as the **inductance** and the **resistance**, respectively. The current $i(t)$ is also called the **response** of the system.

(a) A 12-volt battery is connected to a series circuit in which the inductance is $\frac{1}{2}$ henry and the resistance is 10 ohms. Determine the current i if the initial current is zero.

(b) Solve the equation under the assumption that $E(t) = \sin 20t$ and $i(0) = i_0$.