

**Exam THREE, MTH 205, Summer 2009**

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**QUESTION 1. (20 points)** Consider the following CIRCUIT: Assume  $L = 0.25$  Henry,  $C = 0.01$  Farad. Assume  $E(t) = 50$  voltages at all times,  $q(0) = 4$  Coulombs (note  $q(t)$  is the charge in the capacitor), and  $i(0) = 0$ . Find  $q(t)$ , then find the current at  $t = 4$ .

**QUESTION 2. (20 points)** An object weighing 16 pounds stretches a spring 2 foot. The object is initially released from 1 foot below the equilibrium position with upward velocity 4 ft/sec.

- a) FIND THE EQUATION of MOTION  $x(t)$ .
- b) At what time does the object pass through the equilibrium position heading upward for the second time?

**QUESTION 3. (15 points)** Solve :  $(x^2 + 1)y^{(2)} - 2xy' = \frac{2x(x^2+1)}{x+1}$

**QUESTION 4. (15 points)** Solve :  $(1 + x^2)dy + (2 + y^2)x^3dx = 0$

QUESTION 5. (15 points) Solve:  $y' = \frac{5x+4y}{5x+4y+3}$

QUESTION 6. (15 points) Solve:  $y' = \frac{xy^2 - \cos(x)\sin(x)}{y(1-x^2)}$  such that  $y(0) = 2$

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