

Name \_\_\_\_\_  
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**Math 2250–1**  
**Quiz 2**  
**September 2, 2011**

1) Solve the following initial value problem.

$$\begin{aligned}x'(t) + 0.02 \cdot x(t) &= 1 \\x(0) &= 0\end{aligned}$$

(7 points)

2) A tank contains 100  $l$  of water, which is initially pure. At time  $t = 0$  valves are opened, so that a salt–water solution flows into the tank at a rate of  $2 \frac{l}{s}$ , with a salt concentration of  $0.5 \frac{kg}{l}$ ; at the same time, well–mixed water begins to flow out of the tank at the same rate of  $2 \frac{l}{s}$ , maintaining the constant volume 100  $l$  of water in the tank. Let  $x(t)$   $kg$  be the mass of (dissolved) salt in the tank at time  $t$ . Use input–output modeling to show that  $x(t)$  satisfies the initial value problem in (1).

(3 points)