

M146 Sample Quiz #03 for Thurs, April 13, 2006

(1) Solve the differential equation $y' = -4y + 100e^{-3t} + 2$, with $y(0) = 0$.

(2) A substance S is taken into the stomach, is absorbed into the blood, and then goes from the blood to the liver. S goes from the stomach to the blood at the (continuous) rate of 20 % per hour. S is removed from the blood at the continuous rate of 40 % per hour. In addition some more substance S is injected directly into the bloodstream at the constant rate of 6 mg per hour. Initially 100 mg of the S are present in the stomach, and none in the blood. Let $y(t)$ be the amount of S in the blood at time t . Write a differential equation for the rate of change of y . Find the amount of S in the blood for all times t .

(3) Reduce $\left[\begin{array}{cc|c} 1 & 1 & 3 \\ 2 & 5 & 12 \end{array} \right]$ to echelon form; then find all solutions of

$$\begin{aligned} x_1 + x_2 &= 3 \\ 2x_1 + 5x_2 &= 12 \end{aligned}$$

(4) $A = \begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$ and $b = \begin{bmatrix} 8 \\ 12 \end{bmatrix}$. Find all solutions of $Ax = b$.

(5) $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 5 & 9 \end{bmatrix}$ and $b = \begin{bmatrix} 6 \\ 13 \end{bmatrix}$. Find all solutions of $Ax = b$.

(6) $A = \begin{bmatrix} 2 & 4 \\ 3 & 5 \\ 5 & 3 \end{bmatrix}$ $b = \begin{bmatrix} 6 \\ 8 \\ 7 \end{bmatrix}$. Find all solutions of $Ax = b$.