

M146 Sample Quiz #02b for Thursday, April 6, 2006

(1) Find the solution to $\frac{dy}{dt} = -2(y - 1)^2t$, with $y(1) = 3$.

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

(3) 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 40 % per hour. S is removed from the blood at the continuous rate of 10 % per hour. Initially 100 mg of the S are present in the stomach, and 20mg in the blood. Let $y(t)$ be the amount of S in the blood at time t .

(3a) Write a differential equation for the rate of change of y .

(3b) Find the amount of S in the blood for all times t .

(3c) What is the maximum amount of S in the blood and at what time does it occur?

(4a) A certain drug is administered intravenously at the rate of 2 mg per hour. The drug is excreted from the body at the (continuous) rate of 20 % per hour. Initially there is no drug in the body. Find the amount of the drug in the body for all times t .

(4b) How long does it take for the amount of the drug in the body to reach 90 % of its limiting value?