Question 9 **(7 marks)**

Fermium-257 is a radioactive substance whose decay rate can be modelled by the formula $P = P_0 e^{kt}$, where P is the mass in grams and t is measured in days and P_0 = original amount and k is a constant. The time taken to decay to half of the original amount is known as half-life. The half-life of Fermium-257 is 100.5 days.

(a) Determine the value of k to three significant figures. (3 marks)

(b) How many days will it take for 100 grams of the substance to first decay below five grams? (2 marks)

(c) Determine the rate of change of the amount of Fermium on the day found in part (b). (2 marks)