Question 8 **(11 marks)**

John is given a prescription for blood pressure tablets by his doctor. Each tablet contains five milligrams of the active medication. The mass of active medication, A, remaining in John's body t hours after taking a single tablet is given by

$$A(t) = 5e^{-0.0173t}$$

where A is in milligrams.

(a) Calculate the mass of medication remaining in John's body 10 hours after taking a single tablet. (1 mark)

(b) After how many hours will the mass of medication remaining in John's body have halved? (2 marks)

(c) Determine at what rate the mass of medication remaining in John's body is decreasing 24 hours after taking a single tablet. (3 marks)

If a tablet is taken every T hours, the mass of medication, B, remaining in John's body immediately after taking a tablet will be given by

$$B(T) = \frac{5}{1 - e^{-0.0173T}}$$

where B is in milligrams.

(d) How frequently should John take a tablet so that the mass of medication remaining in his body immediately after taking each tablet is 8.85 mg? (2 marks)

(e) Use the increments formula to approximate the change in B if the time between taking tablets increased by 30 minutes from the time determined in part (d). (3 marks)