

**Question 2**

A radioactive substance decays according to the formula

$$A(t) = A_0 e^{-kt}$$

where  $A_0 = 100$  grams and the half-life of the substance is 10 hours.

- (a) Find the decay constant  $k$ .
- (b) How much of the substance remains after 24 hours?
- (c) After how many hours will only 20 grams remain?

Round all answers to two decimal places.

**Question 2 - Solution**

Use the exact exponential model and keep full precision until the final rounding.

(a)

$$e^{-10k} = 1/2 \implies k = \ln(2)/10$$

$$\boxed{0.07 \text{ hr}^{-1}}$$

The exact value of  $k$  above is used in later parts; its decimal value is 0.069315.

(b)

$$A(24) = 100e^{-24\ln(2)/10}$$

$$\boxed{18.95 \text{ grams}}$$

(c)

$$100e^{-kt} = 20 \implies t = 10 \ln(5)/\ln(2)$$

$$\boxed{23.22 \text{ hours}}$$