

9) In 2023, Graham bought a car for \$28 600. He predicts that the value of the car will be \$17 564 in 2025 and intends to sell it when the value reaches \$8000. If the depreciation of the car follows the model of an exponential function, in what year will he sell his car?

$$y = ac^x$$

$$y = 28\,600(0.78)^x$$

$$8000 = 28\,600(0.78)^x$$

$$0.27972 = (0.78)^x$$

$$\log_{0.78} 0.27972 = x$$

$$\frac{\log 0.27972}{\log 0.78} = x$$

$$x = 5.13 \text{ yrs}$$

$$\frac{17\,564}{28\,600} = \frac{28\,600c^2}{28\,600}$$

$$0.61413 = c^2$$

$$c = \sqrt{0.61413} = 0.78$$

2028

- 10) Many radioactive isotopes are used in medicine for therapies or diagnoses. These isotopes undergo radioactive decay following an exponential curve. Technetium-99m is an isotope used for medical imaging. Its half-life is only 6 hours. For a scan, a patient has been injected with 20 millicuries (mCi) of Technetium-99m. **After how long, to the nearest hour, will there be only 1% of the initial radioactivity remaining in the patient's body?**

$$\begin{aligned}
 & Y = 0.01 \times 20 \\
 & = 0.2 \\
 & a = 20 \\
 & C = \frac{1}{2} \\
 & \text{unit of time} = \text{1 hour} \\
 & Y = ac^{bx} \\
 & 0.2 = 20(0.5)^{\frac{x}{6}} \\
 & 0.01 = (0.5)^{\frac{x}{6}} \\
 & \text{every } \underline{6 \text{ hrs}} \Rightarrow b = \frac{1}{6} \\
 & \log_{0.5} 0.01 = \frac{x}{6} \\
 & \frac{\log 0.01}{\log 0.5} = \frac{x}{6} \\
 & 6.64 = \frac{x}{6} \\
 & 39.86 = x \\
 & 40 \text{ hrs} = x
 \end{aligned}$$