Question 8 **(50 marks)**

The weekly revenue produced by a company manufacturing air conditioning units is seasonal. The revenue (in euro) can be approximated by the function:

$$r(t) = 22\,500\cos\left(\frac{\pi}{26}t\right) + 37\,500, \qquad t \geq 0$$

where t is the number of weeks measured from the beginning of July and $\left(\frac{\pi}{26}t\right)$ is in radians.

(a) Find the approximate revenue produced 20 weeks after the beginning of July.
Give your answer correct to the nearest euro.

(b) Find the two values of the time t, within the first 52 weeks, when the revenue is approximately €26 250.

This question continues on the next page.

(c) Find $r'(t)$, the derivative of $r(t) = 22\,500\cos\left(\frac{\pi}{26}t\right) + 37\,500$.

(d) Use calculus to show that the revenue is increasing 30 weeks after the beginning of July.