Exercice 3.16.

$$P(t) = 80 + 40t^2 \cdot \mathrm{e}^{-0.4t} \quad , \quad t \geq 0$$

a) $t = 0 \Rightarrow P(0) = 80 + 40 \cdot 0^2 \cdot \mathrm{e}^{-0.4 \cdot 0} =$ $\boxed{80\,\text{personnes}}$

b) $t = 8 \Rightarrow P(8) = 80 + 40 \cdot 8^2 \cdot \mathrm{e}^{-0.4 \cdot 8} \cong 184.4 \Rightarrow$ $\boxed{185\,\text{personnes}}$

c) • $P'(t) = (80 + 40t^2 \cdot \mathrm{e}^{-0.4t})' = (80)' + (40t^2)' \cdot \mathrm{e}^{-0.4t} + 40t^2 \cdot (\mathrm{e}^{-0.4t})' =$

$= 0 + 80t \cdot \mathrm{e}^{-0.4t} + 40t^2 \cdot \mathrm{e}^{-0.4t} \cdot (-0.4) = -16t\,\mathrm{e}^{-0.4t}(t - 5)$

• $Z_{P'} = \{5\}$

• Tableau de variation :

t	0		5	
$\operatorname{sgn}(P')$	∄	$+$	0	$-$
variation de P	∄	↗	Max	↘

Max $(5\,;P(5))$

• $t = 5 \Rightarrow P(5) = 80 + 40 \cdot 5^2 \cdot \mathrm{e}^{-0.4 \cdot 5} \cong 215.3 \Rightarrow$ $\boxed{216\,\text{personnes}}$