*The biomass $B(t)$ of a fish population is the total mass of the members of the population at time $t$. It is the product of the number of individuals $N(t)$ in the population and the average mass $M(t)$ of a fish at time $t$. In the case of guppies, breeding occurs continually. Suppose that at time $t = 4$ weeks the population is 820 guppies and is growing at the rate of 50 guppies per week, while the average mass is $1.2\,\mathrm{g}$ and is increasing at the rate of $0.14\,\mathrm{g/week}$. At what rate is the biomass increasing when $t = 4$?*[1]

Here $B(t) = N(t) \cdot M(t)$, so

$$B'(t) = N(t) \cdot M'(t) + M(t) \cdot N'(t)$$

so

$$\begin{aligned} B'(4) &= N(4) \cdot M'(4) + M(4) \cdot N'(4) \\ &= 820 \cdot 0.14 + 1.2 \cdot 50 \\ &= 174.8 \end{aligned}$$

Thus, the biomass is increasing at the rate of $174.8\,\mathrm{g/week}$.

[1] Stewart, *Calculus, Early Transcendentals*, p. 189, #60.