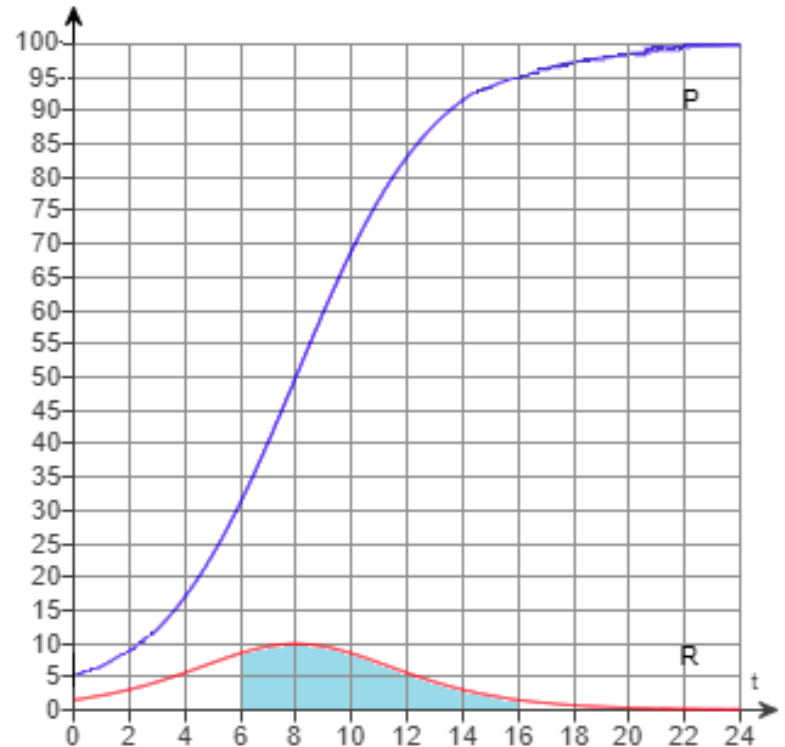


Definite Integrals (Section 5.2) and the *Fundamental* Theorem of Calculus (Section 5.3)

1. The rate $R = P'$ at which people are becoming infected with a contagious virus t weeks after 5 people were infected is graphed to the right, along with the total cumulative number of people, P , who have been infected over the life of the epidemic. It takes 24 weeks for the epidemic to run its course and be over.



- a. Report the shaded area from week 6 to week 16.

$$\int_6^{16} R(t) dt = \int_6^{16} P'(t) dt = \boxed{} \quad \leftarrow \text{unit of measurement}$$

- i. Interpret what this area represents in terms of the context of the epidemic.

- ii. Sketch a segment on the graph of P to represent ΔP for your answer in part a.

- b. What is the **total** area under R ? _____

- i. Sketch a segment on the graph of P to represent ΔP for your answer in part b.

- ii. Interpret what the total area represents in terms of the context of the epidemic.

- c. When is the number of infected increasing the fastest? $t =$ _____ weeks

- d. Complete with whole numbers.

From $0 < t < \boxed{}$ the number infected by the virus _____
 {speeds up, slows down }

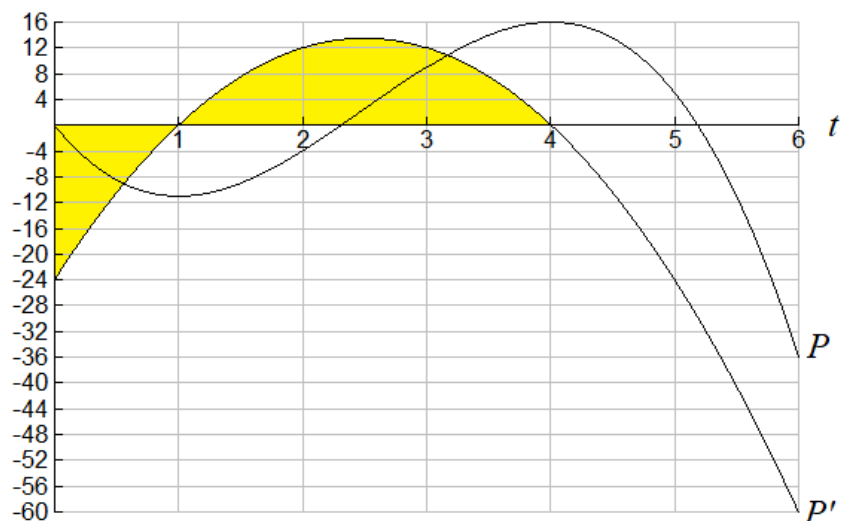
From $\boxed{} < t < \boxed{}$ the number infected by the virus _____
 {speeds up, slows down }

2. The graph shows a company's profit, P , in thousands, and marginal profit P' in thousands per year, for a 6 year interval.

a. $\int_0^4 P'(t) dt = \boxed{}$

- b. Sketch the segment which represents ΔP for this interval.

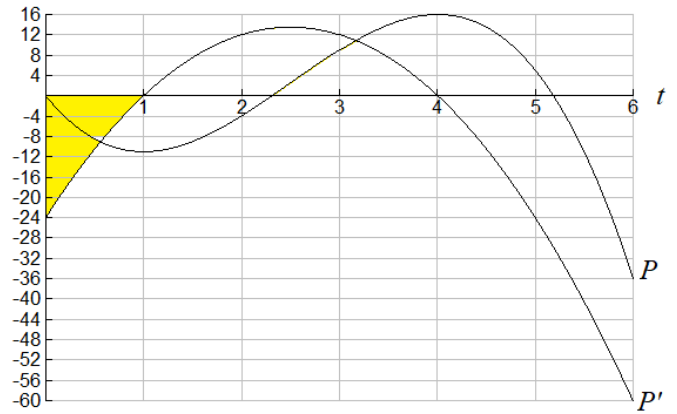
- c. Interpret what this shaded area represents in the context of the company's profits.



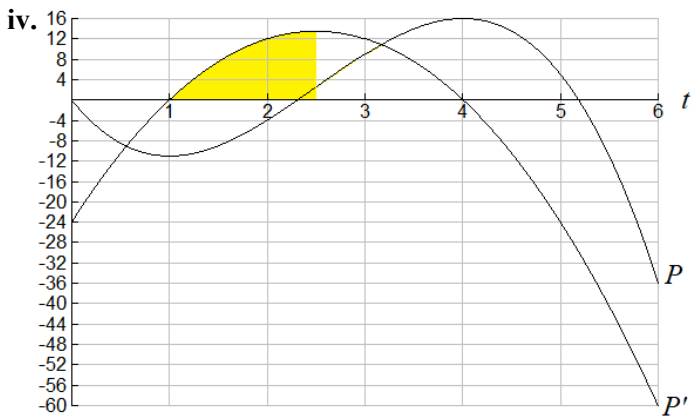
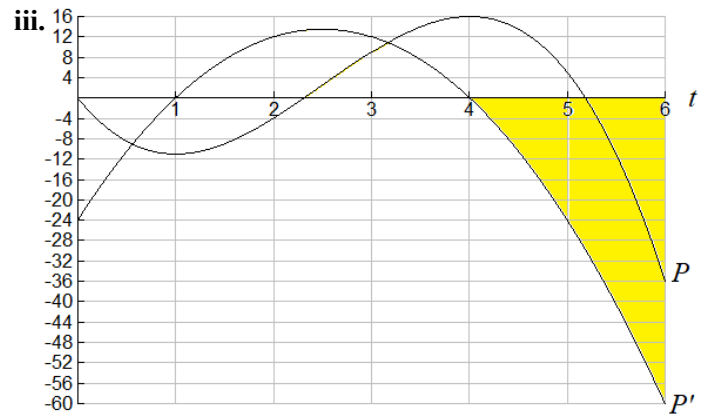
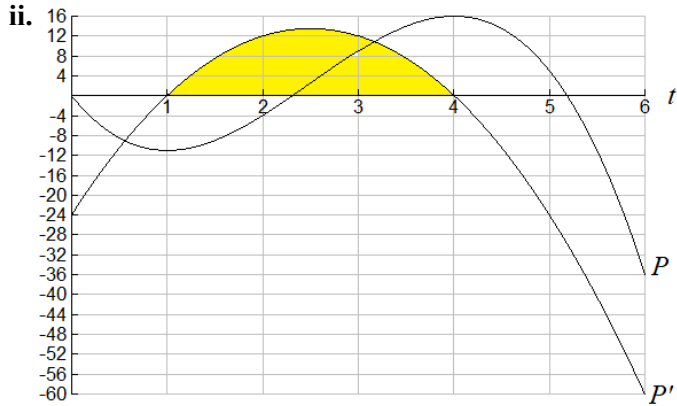
d. It is known that the shaded area under the curve P' from $t = 0$ to $t = 1$ is $-\$11$ and that the curve P' is quadratic.

i. For the area to the right and each of the areas below:

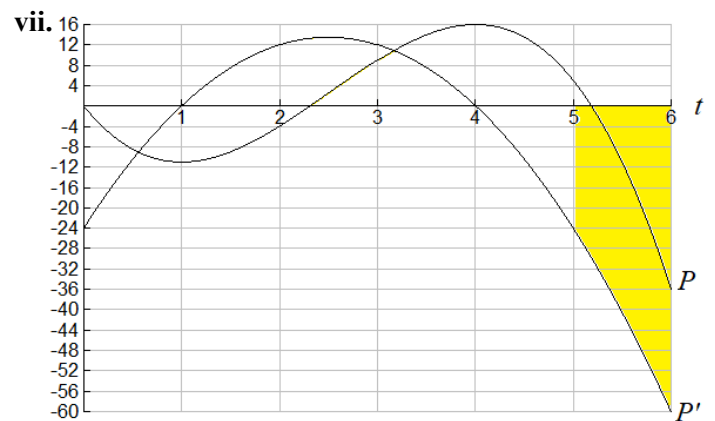
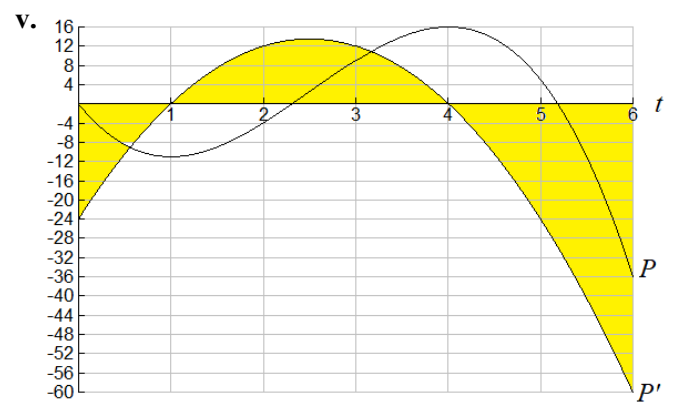
- Sketch the segment which represents ΔP for the interval specified.
- Write the area as a definite integral and give its value.
- Interpret what the area means in terms of the company's profits.



Report $P(1) = \underline{\hspace{2cm}}$



Report $P(2.5) = \underline{\hspace{2cm}}$



Report $P(5) = \underline{\hspace{2cm}}$

e. Give formulas for P and P' .