

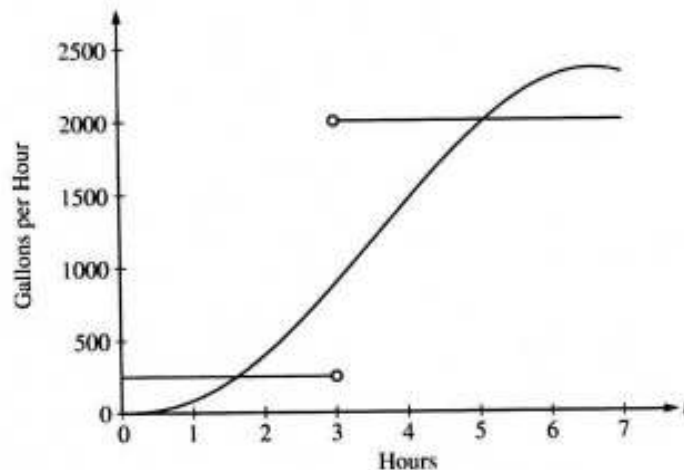
AB CalcLog 5.4

The amount of water in a storage tank, in gallons, is modeled by a continuous function on the time interval $0 \leq t \leq 7$, where t is measured in hours. In this model, rates are given as follows:

(i) The rate at which water enters the tank is $f(t) = 100t^2 \sin(\sqrt{t})$ gallons per hour for $0 \leq t \leq 7$.

(ii) The rate at which water leaves the tank is

$$g(t) = \begin{cases} 250 & \text{for } 0 \leq t < 3 \\ 2000 & \text{for } 3 < t \leq 7 \end{cases} \text{ gallons per hour}$$



The graphs of f and g , which intersect at $t = 1.617$ and $t = 5.076$, are shown in the figure. At time $t = 0$, the amount of water in the tank is 5000 gallons.

1. How many gallons of water enter the tank during the time interval $0 \leq t \leq 7$? Round your answer to the nearest gallons.
2. For $0 \leq t \leq 7$, find the time intervals during which the amount of water in the tank is decreasing. Give a reason for your answer.
3. For $0 \leq t \leq 7$, at what time t is the amount of water in the tank greatest? To the nearest gallon, compute the amount of water at this time. Justify your answer.