Name: ___________________________

CLASSWORK 117

1.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
3	–3	6	–5	1
4	0	3	–3	9
5	3	–2	4	5

The table above shows some of the values of two differentiable functions f and g and their derivatives. If $h(x) = f(x)g(x)$, then $h'(5) =$

(A) 2 (B) 7 (C) 14 (D) 20 (E) 26

Using the values in the table from the previous problem, if $h(x) = f(g(x))$, then $h'(4) =$

(A) –45 (B) –27 (C) –15 (D) 0 (E) 25

x	$g(x)$	$g'(x)$
1	3	4
2	8	3

If $g(x)$ and $g'(x)$ have the values shown in the table above, and $f(x) = g^2(x)$, then $f'(2) =$

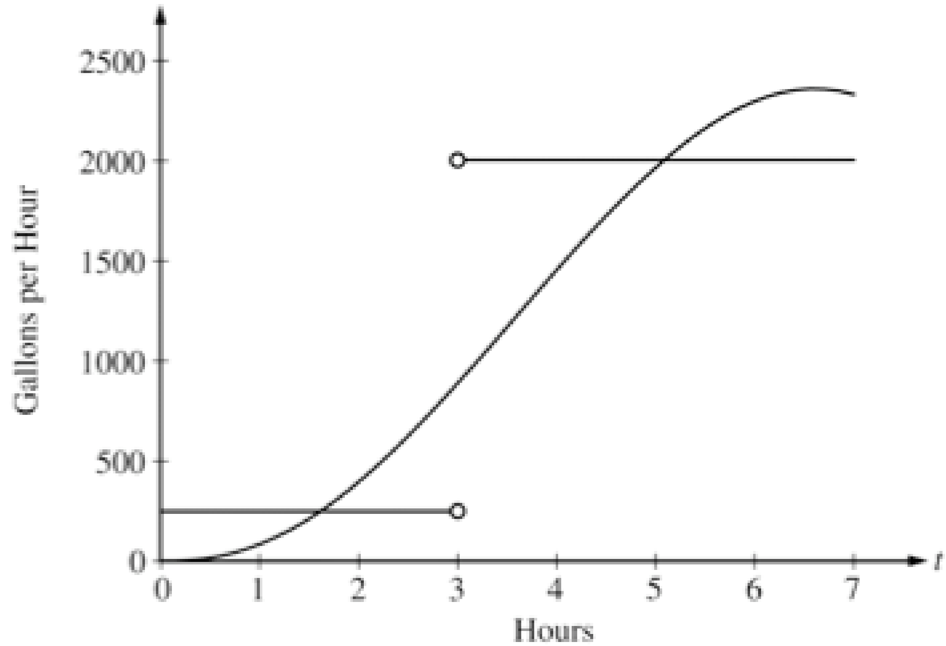
(A) 12 (B) 16 (C) 23 (D) 24 (E) 48

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

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

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

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



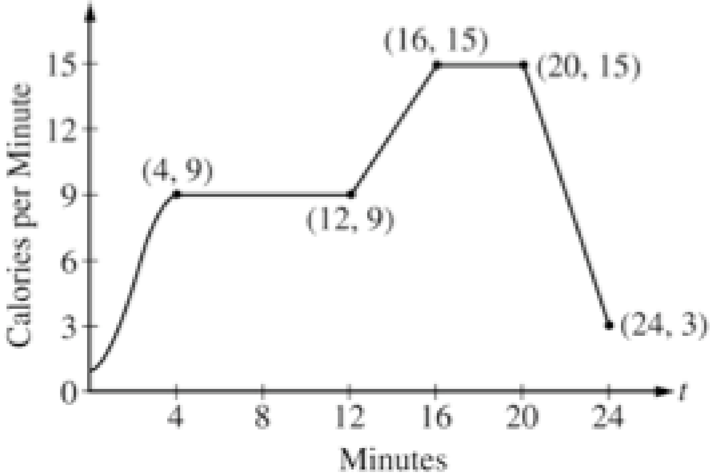
The graphs of f and g, which intersect at $t = 1.617$ and $t = 5.076$, are shown in the figure above. At time $t = 0$, the amount of water in the tank is 5000 gallons.

(a) How many gallons of water enter the tank during the time interval $0 \le t \le 7$? Round your answer to the nearest gallon.

(b) For $0 \le t \le 7$, find the time intervals during which the amount of water in the tank is decreasing. Give a reason for each answer.

(c) For $0 \le t \le 7$, 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.

4. The rate, in calories per minute, at which a person using an exercise machine burns calories is modeled by the function f. In the figure above, $f(t) = -\frac{1}{4}t^3 + \frac{3}{2}t^2 + 1$ for $0 \le t \le 4$ and f is piecewise linear for $4 \le t \le 24$.



(a) Find $f'(22)$. Indicate units of measure.

(b) For the time interval $0 \le t \le 24$, at what time t is f increasing at its greatest rate? Show the reasoning that supports your answer.

(c) Find the total number of calories burned over the time interval $6 \le t \le 18$ minutes.

(d) The setting on the machine is now changed so that the person burns $f(t) + c$ calories per minute. For this setting, find c so that an average of 15 calories per minute is burned during the time interval $6 \le t \le 18$.