t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

3. The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function R of time t. The table above shows the rate as measured every 3 hours for a 24–hour period.

   (a) Use a midpoint Riemann sum with 4 subdivisions of equal length to approximate $\int_0^{24} R(t)\,dt$. Using correct units, explain the meaning of your answer in terms of water flow.

   (b) Is there some time t, $0 < t < 24$, such that $R'(t) = 0$? Justify your answer.

(a) $\int_0^{24} R(t)\,dt \approx 6 \cdot (10.4) + 6(11.2) + 6(11.3) + 6(10.2)$

≈ 258.6 gallons

From time $t=0$ hours to $t=24$ hours the total water flow out of a pipe is approximately 258.6 gallons.

(b) Rolle's theorem guarantees a value of t on $(0,24)$ such that $R'(t) = 0$

because (1) $R(t)$ is differentiable on (a,b)
(2) $R(t)$ is thus continuous on $[a,b]$
(3) $R(0) = 9.6 = R(24)$