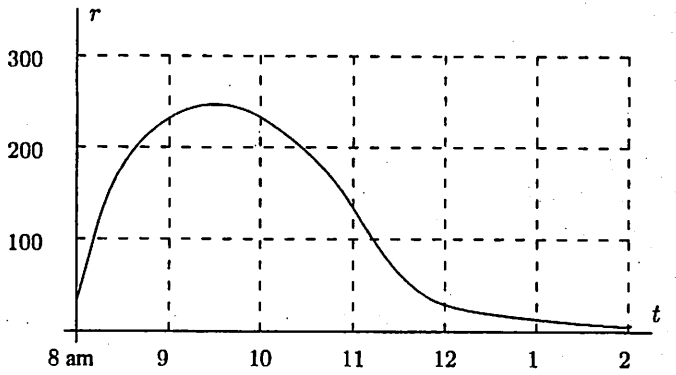
Example 1 Below is the graph[1] of the rate r (in arrivals per hour) at which patrons arrive at the theater in order to get rush seats for the evening performance. The first people arrive at 8 am and the ticket windows open at 9 am. Suppose that once the windows open, people can be served at an (average) rate of 200 per hour.

Use the graph to find or provide an estimate of:

(a) The length of the line at 9 am when the windows open.
(b) The length of the line at 10 am.
(c) The length of the line at 11 am.
(d) The rate at which the line is growing in length at 10 am.
(e) The time at which the length of the line is maximum.
(f) The length of time a person who arrives at 9 am has to stand in line.
(g) The time at which the line disappears.
(h) Suppose you were given a formula for r in terms of t. Explain how you would answer the above questions.



[1]From *Calculus: The Analysis of Functions*, by Peter D. Taylor (Toronto: Wall & Emerson, Inc., 1992). Reprinted with permission of the publisher.