# Version # 8

**CALCULUS AB**

**SECTION II, Part A**

**Time—30 minutes**

**Number of questions—2**

**A GRAPHING CALCULATOR IS REQUIRED FOR THESE QUESTIONS.**

1. People enter a line for an escalator at a rate modeled by the function $r$ given by

$$r(t) = \begin{cases} 33\left(\frac{t}{100}\right)^3\left(1 - \frac{t}{154}\right)^2 & \text{for } 0 \le t \le 300 \\ 0 & \text{for } t > 300, \end{cases}$$

where $r(t)$ is measured in people per second and $t$ is measured in seconds. As people get on the escalator, they exit the line at a constant rate of $0.2$ person per second. There are $30$ people in line at time $t = 0$.

(a) How many people enter the line for the escalator during the time interval $0 \le t \le 300$ ?

(b) During the time interval $0 \le t \le 300$, there are always people in line for the escalator. How many people are in line at time $t = 300$ ?

(c) For $t > 300$, what is the first time $t$ that there are no people in line for the escalator?

(d) For $0 \le t \le 300$, at what time $t$ is the number of people in line a minimum? To the nearest whole number, find the number of people in line at this time. Justify your answer.

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