

**2010 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS**

**CALCULUS AB**  
**SECTION II, Part A**  
**Time—45 minutes**  
**Number of problems—3**

**A graphing calculator is required for some problems or parts of problems.**

1. There is no snow on Janet's driveway when snow begins to fall at midnight. From midnight to 9 A.M., snow accumulates on the driveway at a rate modeled by  $f(t) = 7te^{\cos t}$  cubic feet per hour, where  $t$  is measured in hours since midnight. Janet starts removing snow at 6 A.M. ( $t = 6$ ). The rate  $g(t)$ , in cubic feet per hour, at which Janet removes snow from the driveway at time  $t$  hours after midnight is modeled by

$$g(t) = \begin{cases} 0 & \text{for } 0 \leq t < 6 \\ 125 & \text{for } 6 \leq t < 7 \\ 108 & \text{for } 7 \leq t \leq 9. \end{cases}$$

- (a) How many cubic feet of snow have accumulated on the driveway by 6 A.M.?
- (b) Find the rate of change of the volume of snow on the driveway at 8 A.M.
- (c) Let  $h(t)$  represent the total amount of snow, in cubic feet, that Janet has removed from the driveway at time  $t$  hours after midnight. Express  $h$  as a piecewise-defined function with domain  $0 \leq t \leq 9$ .
- (d) How many cubic feet of snow are on the driveway at 9 A.M.?

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**WRITE ALL WORK IN THE PINK EXAM BOOKLET.**