

**2013 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS**

**CALCULUS AB  
SECTION II, Part A**

**Time—30 minutes**

**Number of problems—2**

**A graphing calculator is required for these problems.**

1. On a certain workday, the rate, in tons per hour, at which unprocessed gravel arrives at a gravel processing plant is modeled by  $G(t) = 90 + 45\cos\left(\frac{t^2}{18}\right)$ , where  $t$  is measured in hours and  $0 \leq t \leq 8$ . At the beginning of the workday ( $t = 0$ ), the plant has 500 tons of unprocessed gravel. During the hours of operation,  $0 \leq t \leq 8$ , the plant processes gravel at a constant rate of 100 tons per hour.
- (a) Find  $G'(5)$ . Using correct units, interpret your answer in the context of the problem.
  - (b) Find the total amount of unprocessed gravel that arrives at the plant during the hours of operation on this workday.
  - (c) Is the amount of unprocessed gravel at the plant increasing or decreasing at time  $t = 5$  hours? Show the work that leads to your answer.
  - (d) What is the maximum amount of unprocessed gravel at the plant during the hours of operation on this workday? Justify your answer.
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