

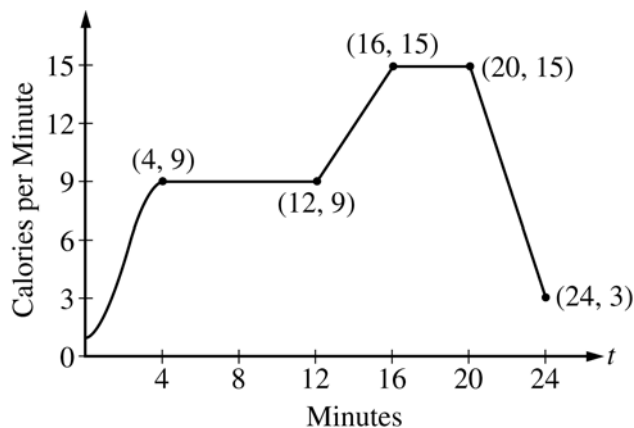
**2006 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS (Form B)**

**CALCULUS AB  
SECTION II, Part B**

**Time—45 minutes**

**Number of problems—3**

**No calculator is allowed for these problems.**



4. The rate, in calories per minute, at which a person using an exercise machine burns calories is modeled by the function  $f$ . In the figure above,  $f(t) = -\frac{1}{4}t^3 + \frac{3}{2}t^2 + 1$  for  $0 \leq t \leq 4$  and  $f$  is piecewise linear for  $4 \leq t \leq 24$ .
- (a) Find  $f'(22)$ . Indicate units of measure.
- (b) For the time interval  $0 \leq t \leq 24$ , at what time  $t$  is  $f$  increasing at its greatest rate? Show the reasoning that supports your answer.
- (c) Find the total number of calories burned over the time interval  $6 \leq t \leq 18$  minutes.
- (d) The setting on the machine is now changed so that the person burns  $f(t) + c$  calories per minute. For this setting, find  $c$  so that an average of 15 calories per minute is burned during the time interval  $6 \leq t \leq 18$ .

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