Section II—Part A

Number of Questions	Time	Use of Calculator
2	30 Minutes	Yes

Directions:

Show all work. You may *not* receive any credit for correct answers without supporting work. You may use an approved calculator to help solve a problem. However, you must clearly indicate the setup of your solution using mathematical notations and *not* calculator syntax. Calculators may be used to find the derivative of a function at a point, compute the numerical value of a definite integral, or solve an equation. Unless otherwise indicated, you may assume the following: (a) the numeric or algebraic answers need not be simplified; (b) your answer, if expressed in approximation, should be rounded to 3 places after the decimal point; and (c) the domain of a function f is the set of all real numbers.

1. The slope of a function at any point (x, y) is $\frac{e^x}{e^x+1}$. The point $(0, 2\ln 2)$ is on the graph of f.

(A) Write an equation of the tangent line to the graph of f at $x=0$.

(B) Use the tangent line in part (A) to approximate $f(0.1)$ to the nearest thousandth.

(C) Solve the differential equation $\frac{dy}{dx}=\frac{e^x}{e^x+1}$ with the initial condition $f(0)=2\ln 2$.

(D) Use the solution in part (C) and find $f(0.1)$ to the nearest thousandth.

2. The temperature in a greenhouse from 7:00 p.m. to 7:00 a.m. is given by $f(t)=96-20\sin\left(\frac{t}{4}\right)$, where $f(t)$ is measured in Fahrenheit, and t is the number of hours since 7:00 p.m.

(A) What is the temperature of the greenhouse at 1:00 a.m. to the nearest degree Fahrenheit?

(B) Find the average temperature between 7:00 p.m. and 7:00 a.m. to the nearest tenth of a degree Fahrenheit.

(C) When the temperature of the greenhouse drops below 80°F, a heating system will automatically be turned on to maintain the temperature at a minimum of 80°F. At what value of t to the nearest tenth is the heating system turned on?

(D) The cost of heating the greenhouse is \$0.25 per hour for each degree. What is the total cost to the nearest dollar to heat the greenhouse from 7:00 p.m. and 7:00 a.m.?

STOP. AP Calculus AB Practice Exam 1 Section II—Part A

Section II—Part B

Number of Questions	Time	Use of Calculator
4	60 Minutes	No

Directions:

The use of a calculator is not permitted in this part of the exam. When you have finished this part of the exam, you may return to the problems in Part A of Section II and continue to work on them. However, you may *not* use a calculator. You should *show all work.* You may *not* receive any credit for correct answers without supporting work. Unless otherwise indicated, the numeric or algebraic answers need not be simplified, and the domain of a function f is the set of all real numbers.

3. A particle is moving on a straight line. The velocity of the particle for $0 \le t \le 30$ is shown in the table below for selected values of t.

t (sec)	0	3	6	9	12	15	18	21	24	27	30
$v(t)$ (m/sec)	0	7.5	10.1	12	13	13.5	14.1	14	13.9	13	12

(A) Using MRAM (Midpoint Rectangular Approximation Method) with five rectangles, find the approximate value of $\int_0^{30} v(t)\,dt$.

(B) Using the result in part (A), find the average velocity over the interval $0 \le t \le 30$.

(C) Find the average acceleration over the interval $0 \le t \le 30$.

(D) Find the approximate acceleration at $t = 6$.

(E) During what intervals of time is the acceleration negative?

4. (See Figure 1T-13.)

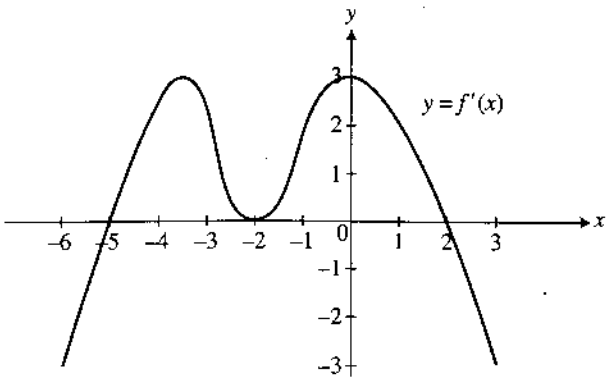

Figure 1T-13

The graph of f', the derivative of a function f, for $-6 \le x \le 3$ is shown in Figure 1T-13.

(A) At what value(s) of x does f have a relative maximum value? Justify your answer.

(B) At what value(s) of x does f have a relative minimum value? Justify your answer.

(C) At what value(s) of x does the function have a point of inflection? Justify your answer.

(D) If $f(-5) = 2$, draw a possible sketch of f on $-6 < x < 3$.

5. Given the equation $y^2 - x + 2y - 3 = 0$:

(A) Find $\frac{dy}{dx}$.

(B) Write an equation of the line tangent to the graph of the equation at the point $(0, -3)$.

(C) Write an equation of the line normal to the graph of the equation at the point $(0, -3)$.

(D) The line $y = \frac{1}{4}x + 1$ is tangent to the graph at point P. Find the coordinates of point P.

6. Let R be the region enclosed by the graph of $y = x^2$ and the line $y = 4$.

(A) Find the area of region R.

(B) If the line $x = a$ divides region R into two regions of equal area, find a.

(C) If the line $y = b$ divides the region R into two regions of equal area, find b.

(D) If region R is revolved about the x-axis, find the volume of the resulting solid.

STOP. AP Calculus AB Practice Exam 1 Section II—Part B