

The College Board
Advanced Placement Examination
CALCULUS AB
SECTION II
Time—1 hour and 30 minutes

3?

1. Given the function f defined by $f(x) = 2x^3 - 3x^2 - 12x + 20$.
 - (a) Find the zeros of f .
 - (b) Write an equation of the line normal to the graph of f at $x = 0$.
 - (c) Find the x - and y -coordinates of all points on the graph of f where the line tangent to the graph is parallel to the X -axis.

2. A function f is defined by $f(x) = xe^{-2x}$ with domain $0 \leq x \leq 10$.
 - (a) Find all values of x for which the graph of f is increasing and all values of x for which the graph is decreasing.
 - (b) Give the x - and y -coordinates of all absolute maximum and minimum points on the graph of f . Justify your answers.

3. Find the maximum volume of a box that can be made by cutting out squares from the corners of an 8-inch by 15-inch rectangular sheet of cardboard and folding up the sides. Justify your answer.

4. A particle moves along a line so that at any time t its position is given by $x(t) = 2\pi t + \cos 2\pi t$.
 - (a) Find the velocity at time t .
 - (b) Find the acceleration at time t .
 - (c) What are all values of t , $0 \leq t \leq 3$, for which the particle is at rest?
 - (d) What is the maximum velocity?

5. Let R be the region bounded by the graph of $y = \frac{1}{x} \ln x$, the X -axis, and the line $x = e$.
 - (a) Find the area of the region R .
 - (b) Find the volume of the solid formed by revolving the region R about the Y -axis.
