



AP Calculus AB
Q2 Interim Assessment
January 2016

Section II – Part A (30 Minutes)
Calculators Allowed

Student Name: _____

School: _____

Teacher: _____

SECTION II – PART A DIRECTIONS

30 Minutes: 2 Open Response (9 points each)

Solve each of the following problems, showing ALL work. Your work will be scored on the correctness and completeness of your methods as well as your answers. Unless otherwise specified, answers (numeric or algebraic) need not be simplified. If you use decimal approximations in calculations, your work will be scored on accuracy. Unless otherwise specified, your final answers should be accurate to three places after the decimal point. You may use a calculator during this section. **ALL work must be completed in pencil.** Only work completed in the test booklet will be graded.

t (days)	0	10	22	30
$W'(t)$ (GL per day)	0.6	0.7	1.0	0.5

1. The twice-differentiable function W models the volume of water in a reservoir at time t , where $W(t)$ is measured in gigaliters (GL) and t is measured in days. The table above gives values of $W'(t)$ sampled at various times during the interval $0 \leq t \leq 30$ days. At time $t = 30$, the reservoir contains 125 gigaliters of water.

(a) Estimate $W''(5)$. Indicate units of measure.

(b) Use the tangent line approximation to W at time $t = 30$ to predict the volume of the water, $W(t)$, in GL, in the reservoir at time $t = 32$. Show the computations that lead to your answer.

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1. The twice-differentiable function W models the volume of water in a reservoir at time t , where $W(t)$ is measured in gigaliters (GL) and t is measured in days. The table above gives values of $W'(t)$ sampled at various times during the interval $0 \leq t \leq 30$ days. At time $t = 30$, the reservoir contains 125 gigaliters of water.

(c) The equation $A = 0.3W^{2/3}$ gives the relationship between the area A , in square kilometers, of the surface of the reservoir, and the volume of water $W(t)$, in gigaliters, in the reservoir. Find the instantaneous rate of change of A , in square kilometers per day, with respect to t when $t = 30$ days.

2. The function g is defined for $x > 0$ with $g(1) = 2$, $g'(x) = \sin\left(x + \frac{1}{x}\right)$, and

$$g''(x) = \left(1 - \frac{1}{x^2}\right) \cos\left(x + \frac{1}{x}\right).$$

- (a) Find all values of x in the interval $[0.12, 1]$ at which the graph of g has a horizontal tangent, and determine whether g has a local maximum, a local minimum, or neither at each of these values of x . Justify your answers.
- (b) On what subintervals of $(0.12, 1)$, if any, is the graph of g concave down? Justify your answer.
- (c) Write an equation for the line tangent to the graph of g at $x = 1$.
- (d) Does the line tangent to the graph of g at $x = 1$ lie above or below the graph on $(0.3, 1)$? Why?

END OF SECTION II – PART A

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS PART ONLY.
DO NOT GO ON TO PART B UNTIL YOU ARE TOLD TO DO SO.
