



AP Calculus AB
Q2 Interim Assessment
January 2016

Section II – Part B (60 Minutes)
No Calculators Allowed

Student Name: _____

School: _____

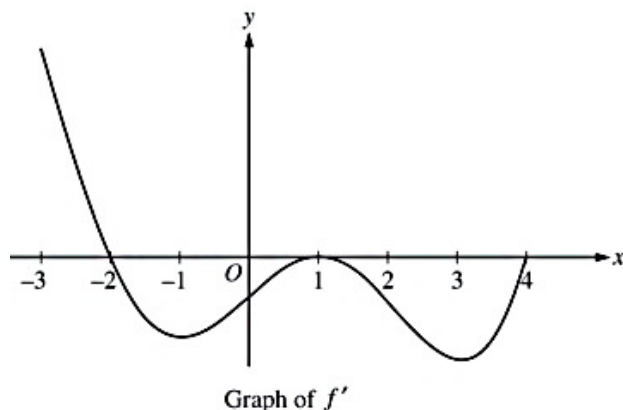
Teacher: _____

SECTION II – PART B DIRECTIONS

60 Minutes: 4 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. **ALL work must be completed in pencil.** You may not use a calculator. Only work completed in the test booklet will be graded.

3. The figure below shows the graph of f' , the derivative of a twice-differentiable function f , on the interval $[-3, 4]$. The graph of f' has horizontal tangents at $x = -1$, $x = 1$, and $x = 3$.
- (a) Find all x -coordinates at which f has a relative maximum. Give a reason for your answer.
 - (b) On what open intervals contained in $(-3, 4)$ is the graph of f both concave down and decreasing? Give a reason for your answer.
 - (c) Find the x -coordinates of all points of inflection of $f(x)$. Give a reason for your answer.
 - (d) If $h(x) = f(\sin(\pi x))$, find $h'(x)$.



4. Let f be the function given by $f(x) = (x^2 - 2x - 1)e^x$.

(a) Find $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$.

(b) Find the interval(s) on which f is increasing. Justify your answer.

(c) Find the interval(s) on which f is concave down. Justify your answer.

5. The function f is defined by $f(x) = \sqrt{25 - x^2}$ for $[-5, 5]$.

(a) Find $f'(x)$.

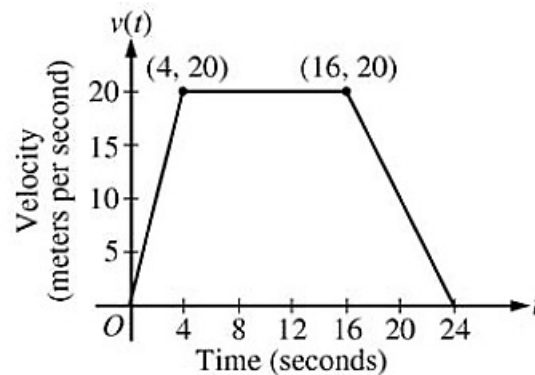
(b) Write an equation for the line normal to the graph of f at $x = -3$.

5. The function f is defined by $f(x) = \sqrt{25 - x^2}$ for $[-5, 5]$.

(c) Find the value of $\int_{-5}^5 f(x) dx$. Show the work that leads to your answer.

(d) Let g be the function defined by $g(x) = \begin{cases} f(x) & -5 \leq x < -3 \\ x+6 & -3 < x \leq 5 \end{cases}$. Is g continuous at $x = -3$? Write a concluding statement involving the definition of continuity.

6. A car is traveling on a straight road. For $0 \leq t \leq 24$ secs, the car's velocity $v(t)$, in meters per second, is modeled by the piecewise-linear function defined by the graph.



- (a) Find $\int_0^{24} v(t) dt$.
- (b) For each of $v'(4)$ and $v'(20)$, find the value or explain why it does not exist. Indicate units of measure.
- (c) Let $a(t)$ be the car's acceleration at time t , in meters per second per second. For $0 < t < 24$, write a piecewise-defined function for $a(t)$.
- (d) Find the average rate of change of v over the interval $8 \leq t \leq 20$. Does the Mean Value Theorem guarantee a value for c , for $8 < c < 20$, such that $v'(c)$ is equal to this average rate of change? Why or why not?

END OF EXAM
