NAME: _____

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KNOW / 12	APP / 12	INQ / 12	COMM / 6

MHF4U1 - UNIT 2 – RATES OF CHANGE
TEST

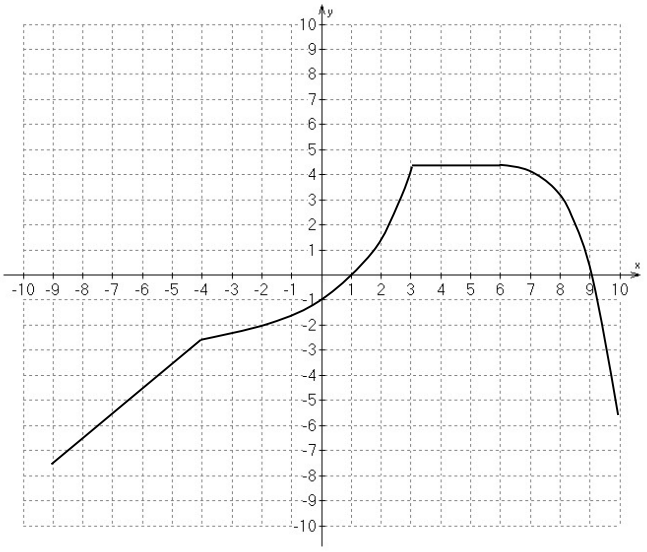
ROUND ALL ANSWERS TO THE NEAREST TENTH UNLESS STATED OTHERWISE

PART ONE – Multiple Choice (*K – 1 mark each*)
Identify the letter of the choice that best completes the statement or answers the question.

_____ 1) The slope of a tangent line always tells us
a) an instantaneous rate of change
b) whether the graph is increasing or decreasing at the point of tangency
c) all of the above
d) none of the above

_____ 2) An average rate of change is given by
a) the *y*-intercept of a secant line
b) the slope of a secant line
c) the reciprocal of a secant line's slope
d) a graph's local maxima and minima

Questions 3 through 5 refer to the graph of y = f(x) shown on the right.



_____ 3) On the interval $7 < x < 8$,
a) the corresponding rate of change graph would have negative values.
b) the average rate of change of $f(x)$ is equal to the instantaneous rate of change at any point.
c) the tangent slopes reach a maximum.
d) the tangent slopes reach a minimum.

_____ 4) On the interval $-2 < x < 2$,
a) it is possible to achieve a negative average rate of change.
b) the instantaneous rate of change of $f(x)$ is constant.
c) the instantaneous rate of change of $f(x)$ is always positive.
d) all of the above.

_____ 5) On the interval $4 < x < 5$,
a) the instantaneous rate of change of $f(x)$ is always positive.
b) the instantaneous rate of change of $f(x)$ is increasing.
c) instantaneous rate of change of $f(x)$ cannot be calculated .
d) none of the above.

PART TWO – Full Solution

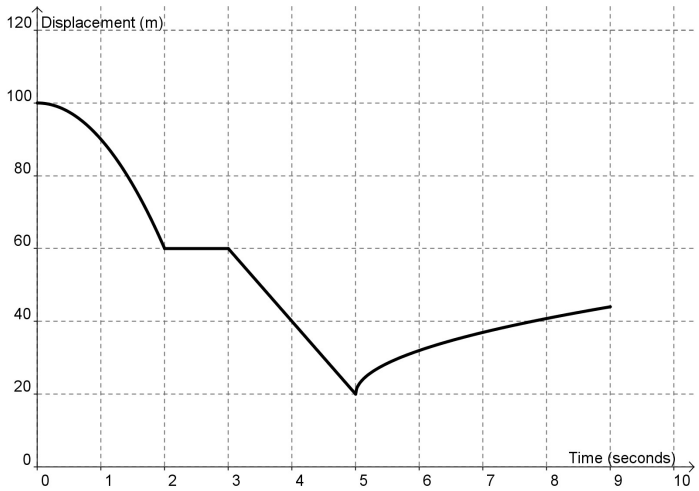
6) Determine, to the nearest tenth, the instantaneous rate of change of the function $f(x) = 2x^3 - 5x^2 - 4$ where $x = -2.5$. (*K – 5 marks*)

7) Determine the average rate of change of the function $f(x) = -6\sqrt{x+5} - 8x$ on the interval $-2 \le x \le 5$. Round your final answer to the nearest tenth. (*K – 2 marks*)

8) For the function $f(x) = x^4 + 2x^3 - 23x^2 - 24x + 136$, use secant slopes to verify that a local maximum or minimum occurs at the point where $x = 3$. State whether it is a maximum or a minimum that occurs at this point. (*A – 5 marks*)

9) Consider the displacement-time graph shown below, where displacement is measured in metres and time is measured in seconds.

DISPLACEMENT-TIME GRAPH



VELOCITY-TIME GRAPH

a) Determine the average velocity in the first 5 seconds. (*A – 2 marks*)

b) Determine the instantaneous velocity at 4 seconds. (*A – 2 marks*)

c) Draw a clearly labeled corresponding velocity-time graph on the provided axes. (*A – 3 marks*)

10) Determine the **equation of the tangent** to the graph of $y = -5x^2 + 2x - 6$ at the point where $x = 10$. (*I – 6 marks*)

11) A maple cookie is dropped from a height of 19.6 m. Its height above the ground, in metres, t seconds after it is dropped is given by the equation $h(t) = 19.6 - 4.9t^2$. Determine how fast the cookie is falling when it hits the ground. Round your final answer to the nearest tenth. (*I – 6 marks*)

12) Albert claims that the functions $f(x) = 3^{2x} + 5$ and $g(x) = 3^{2x} + 8$ have different instantaneous rates of change for some x-values. Is Albert's claim correct? Explain. (*C – 3 marks*)

13) Fill in the boxes with possible values such that the following function has a positive instantaneous rate of change for $x < -4$ and a negative instantaneous rate of change for $x > -4$. (*C – 3 marks*)

$$y = \square\left(x + \square\right)^{\square} - 9$$