Matthew Boelkins **MTH201-09**
Assignment 09.02.15.Sec1.1 due 09/08/2015 at 11:59pm EDT

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1. (2 pts) Consider a car whose position, s, is given by the table

t (s)	0	0.2	0.4	0.6	0.8	1
s (ft)	0	0.35	1.8	3.8	6.5	9.6

Find the average velocity over the interval $0 \le t \le 0.2$.
average velocity = ____ (include **units**)
Estimate the velocity at $t = 0.2$.
velocity = ____ (include **units**)

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2. (2 pts) The table below shows the number of calories used per minute as a function of an individual's body weight for three sports:

Activity	100 lb	120 lb	150 lb	170 lb	200 lb	220 lb
Walking	2.7	3.2	4	4.6	5.4	5.9
Bicycling	5.4	6.5	8.1	9.2	10.8	11.9
Swimming	5.8	6.9	8.7	9.8	11.6	12.7

a) Determine the number of calories that a 200 lb person uses in one half-hour of walking . _____ calories
b) Who uses more calories, a 100 lb person swimming for one hour, or a 220 lb person bicycling for a half-hour?

- A.
- B. The 100 lb person swimming for one hour
- C. The 220 lb person bicycling for a half-hour
- D. They both use the same amount of calories

c) Does the number of calories of a person bicycling increase or decrease as weight increases?

- A. Increase
- B. Decrease

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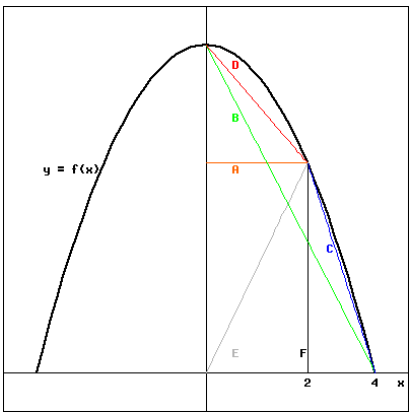
3. (3 pts) Let $f(x) = 16 - x^2$.
a) Compute each of the following expressions and interpret each as an average rate of change:
(i) $\frac{f(2)-f(0)}{2-0} =$ _____
(ii) $\frac{f(4)-f(2)}{4-2} =$ _____
(iii) $\frac{f(4)-f(0)}{4-0} =$ _____
b) Based on the graph sketched below, match each of your answers in (i) - (iii) with one of the lines labeled A - F. Type the corresponding letter of the line segment next to the appropriate formula. Clearly not all letters will be used.



(click on image to enlarge)

____	$\frac{f(2)-f(0)}{2-0}$
____	$\frac{f(4)-f(2)}{4-2}$
____	$\frac{f(4)-f(0)}{4-0}$

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4. (2 pts) The table below gives the average temperature, T, at a depth d, in a borehole in Belleterre, Quebec.

d, depth (m)	T, temp (C°)
25	5.50
50	5.20
75	5.10
100	5.10
125	5.30
150	5.50
175	5.75
200	6.00
225	6.25
250	6.50
275	6.75
300	7.00

Evaluate $\Delta T/\Delta d$ on the following intervals
a) $75 \le d \le 125$ $\Delta T/\Delta d =$ _____
b) $125 \le d \le 275$ $\Delta T/\Delta d =$ _____
c) $50 \le d \le 125$ $\Delta T/\Delta d =$ _____
d) Which of the statements below correctly explains the significance of your answer to part (c)? Select all that apply (more than one may apply).

- A. The temperature changes by a total of 0.0013 degrees Celsius when moving from a depth 50 meters to 125 meters.

- B. Over the interval from 50 meters to 125 meters, the temperature changes on average at a rate of 0.0013 degrees Celsius per meter.
- C. On average, the temperature is changing at a rate of 0.0013 degrees Celsius per minute over the interval $50 \le d \le 125$.
- D. 0.0013 is the slope of the graph of at $d = 50$.
- E. The temperature is changing at a rate of 0.0013 degrees Celsius per minute when the depth is 50 meters.
- F. None of the above

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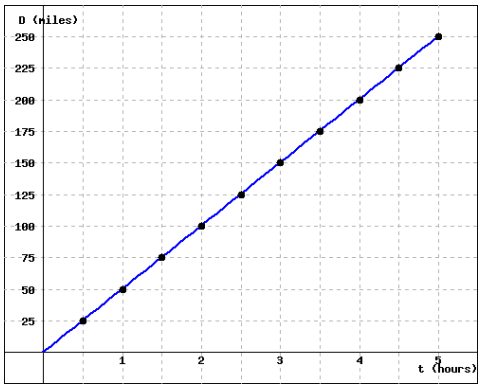
5. (2 pts) The graph below shows the distance traveled, D (in miles) as a function of time, t (in hours).



(Click on the graph to get a larger version.)

a) For each of the intervals, find the values of ΔD and Δt between the indicated start and end times. Enter your answers in their respective columns in the table below.

Time Interval	ΔD	Δt
t = 2 to t = 4.5	_____	_____
t = 1 to t = 4	_____	_____
t = 0.5 to t = 2.5	_____	_____

b) Based on your results from (a) it follows that the average rate of change of D is constant, it does not depend over which interval of time you choose. What is the constant rate of change of D?

$\frac{\Delta D}{\Delta t} =$ _____

c) Which of the statements below CORRECTLY explains the significance of your answer to part (b)? Select ALL that apply (more than one may apply).

- A. It is the acceleration of the car over the five hour time interval.
- B. It is the slope of the line.
- C. It is the total distance the car travels in five hours.
- D. It is the average velocity of the car over the first two hours.
- E. It is how far the car will travel in a half-hour.
- F. It represents the car's velocity.
- G. None of the above

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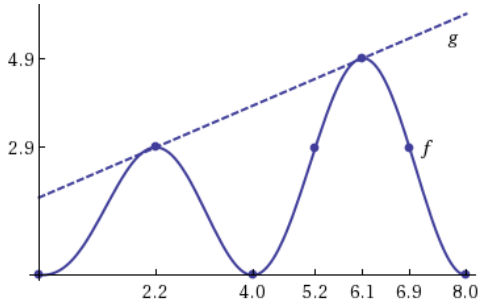
6. (2 pts) Consider the graphs of $f(x)$ and $g(x)$ below:



For each interval given below, decide whether the average rate of change of $f(x)$ or $g(x)$ is greater over that particular interval.

Interval	Which function has GREATER average rate of change?
$5.2 \le x \le 8$	?
$2.2 \le x \le 6.9$	?
$5.2 \le x \le 6.1$	?
$2.2 \le x \le 4$	?
$0 \le x \le 4$	?

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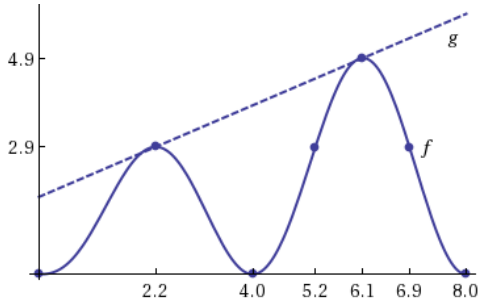
7. (2 pts) Consider the graphs of $f(x)$ and $g(x)$ below:



For each interval given below, decide whether the average rate of change of $f(x)$ is positive, negative, or zero over that particular interval.

Interval	Sign of Average Rate of Change of $f(x)$
$2.2 \le x \le 6.1$	?
$5.2 \le x \le 8$	?
$0 \le x \le 2.2$	?
$0 \le x \le 8$	?
$0 \le x \le 4$	?

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8. (3 pts) Consider the function $f(x) = x^2 + 1$ and find the following:

a) The average rate of change between the points $(-1, f(-1))$ and $(2, f(2))$.

b) The average rate of change between the points $(a, f(a))$ and $(b, f(b))$.

_____

c) The average rate of change between the points $(x, f(x))$ and $(x+h, f(x+h))$.

_____

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9. (1 pt) A car is driven at a speed that is initially high and then decreases, starting at noon. Which of the following could be a graph of the distance the car has traveled as a function of time past noon?

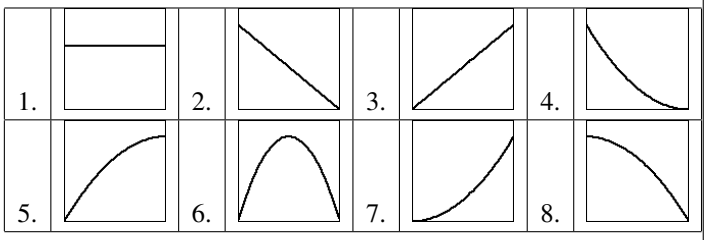

figure ___.

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10. (3 pts) Consider the function $f(x) = 5x - 4$ and find the following:

a) The average rate of change between the points $(-1, f(-1))$ and $(3, f(3))$.

_____

b) The average rate of change between the points $(a, f(a))$ and $(b, f(b))$.

_____

c) The average rate of change between the points $(x, f(x))$ and $(x+h, f(x+h))$.

_____

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11. (1 pt) Estimate the following limit by substituting smaller and smaller values of h.

$\lim_{h \to 0} \frac{(7+h)^3 - 343}{h} =$ ____

(Your answer should be accurate within 0.001.)

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12. (1 pt) Estimate the following limit by substituting smaller and smaller values of h.

$\lim_{h \to 0} \frac{10^h - 1}{h} =$ ____

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13. (1 pt) Use algebra to evalute the following limit.

$\lim_{h \to 0} \frac{(3+h)^2 - 9}{h} =$ _____