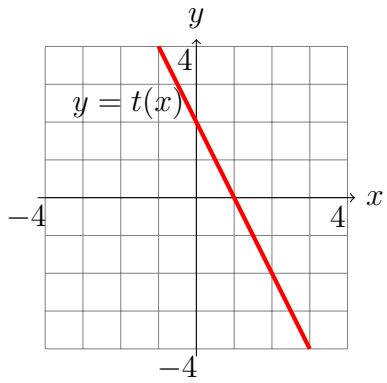
Math 106-Sec 250 Fall '15 **Exam 1** **Score:** _____

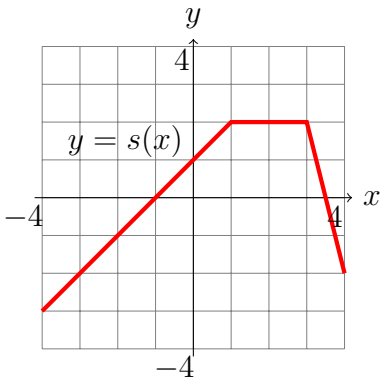
Print Your Name: _____ **TA's Name:** _____

Problem	1	2	3	4	5	6	7	Total
Score								

Instructions: You must show supporting work as much as possible to receive full and partial credits. No text book, notes, formula sheets are allowed.

1. (**20 pts**) The graphs of function $t(x)$ and $s(x)$ are given below.





(a) (5 pts) Find $t'(0.5)$

(b) (5 pts) Find $h'(2)$ if $h(x) = t(x)s(x)$

(c) (10 pts) Use the **definition** only to find the derivative function $f'(x)$ if $f(x) = \dfrac{1}{x}$. Any other method receives no credit.

(*Page 1. Continue on Next Page ...*)

2. (**16 pts**, 4 pts each) The concentration (μg/cm^3) of a drug in the bloodstream at time t (min.) is given for some point values in the table below

t	0	0.1	0.2	0.3	0.4
$c(t)$	0.84	0.89	0.94	0.98	1.00

(a) Find the **average** rate of change of the concentration in the time interval $[0, 0.4]$.

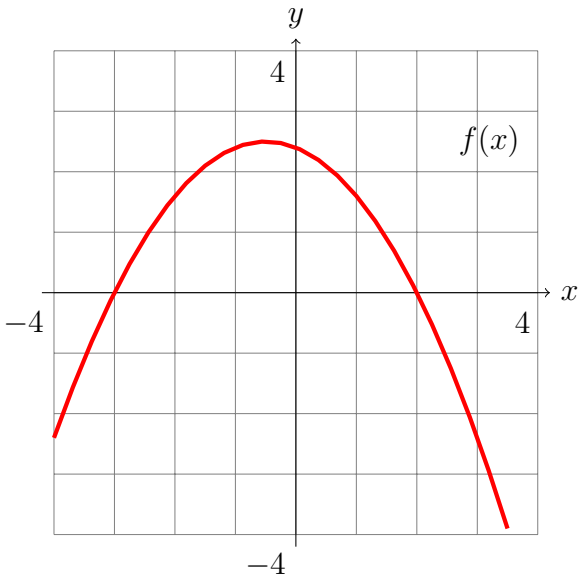
(b) Estimate the instantaneous rate of change, $c'(0.2)$, together with its unit.

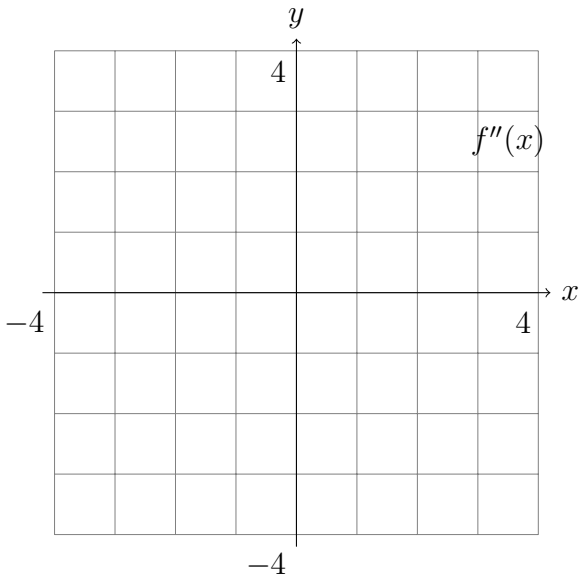
(c) Write the equation of a possible tangent line to the function at the time $t = 0.2$.

(d) Let $f(x) = \begin{cases} 3 - x, & x < 2 \\ kx^2, & x \geq 2 \end{cases}$ Find the side limit $\lim\limits_{x \to 2^-} f(x)$, $\lim\limits_{x \to 2^+} f(x)$, and determine the parameter value k to make the function f continuous everywhere.

(*Page 2. Continue on Next Page ...*)

3. (**12 pts**) The graph of a function $y = f(x)$ is given below.





(a) In the same coordinate frame sketch the derivative function $f'(x)$. Make sure to label any special special points such as maximal points, minimal points, and x-intercept points.

(b) In the frame on the right sketch the second derivative function $f''(x)$.

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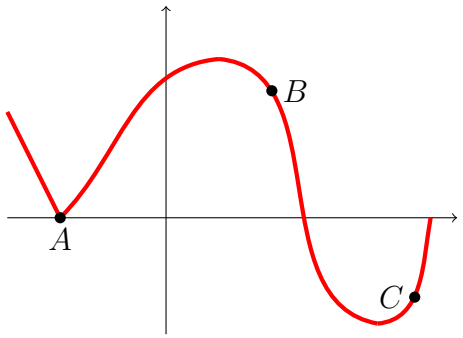
4. (**14 pts**) Find the derivatives of the following functions. (**Do not simplify the answer.**)

(a) $f(x) = \dfrac{\sin(x)}{2x+3}$. Find $f'(0)$.

(a) $g(x) = e^{x^2+1}\cos(2x)$

(*Page 3. Continue on Next Page ...*)

5. (**12 pts**) The graph of a function f is given below.



Point	f	f'	f''
A			
B			
C			

(a) (8 pts) Fill in the table with either the sign (+, −, or 0) of f, f', f'' or NE (for Not Existing) at each marked point.

(b) (4 pts) If the x-coordinate of the point C is 3 and the tangent line of the function at C is $5x - 2y = 17$, find the following

The y-coordinate of C: _____ The derivative $f'(3)$: _____

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6. (**12 pts**, 6 pts each) Some information about function f and g are given in the table.

x	1	2	3	4
$f(x)$	3	4	1	2
$f'(x)$	2	0	-1	1
$g(x)$	2	1	4	3
$g'(x)$	3	2	1	0

Find the following values:

(a) $r'(4)$ if $r(x) = f(g(x))$;

(b) $s'(4)$ if $s(x) = [f(x)]^2 + x$;

(*Page 4. Continue on Next Page ...*)

7. (**14 pts**) Use algebra and the fact that $\lim_{x\to+\infty} \frac{1}{x^n} = 0$ for any $n > 0$ to find the following limits. (**Numerical or graphical solution will not be accepted.**)

(a) $\lim\limits_{x\to+\infty} \dfrac{2x^3+3}{x^3+2x-\sqrt{x}}$

(b) $\lim\limits_{x\to 1} \dfrac{x^2+x-2}{x-1}$

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2 point Bonus Question: How many schools are in the Big10 Conference? (a) 10 (b) 11 (c) 12 (d) 13 e) 14