HONOR 2201, CALCULUS FOR NON-SCIENCE MAJORS, QUIZ 3, 09/16/05

Name : Solution Student ID # : ____________

Each problem of #1–#3 is worth 5 points.

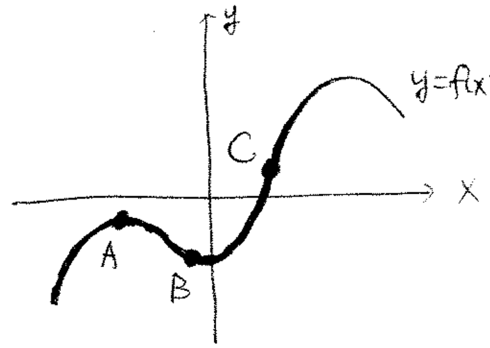
1. Find the derivative function $f'(x)$ by using the limit definition for $f(x) = 2x + 1$.
(**NO credit** will be given for using any other formula or estimation over shorter intervals.)

$$f'(x) = \lim_{b \to x} \frac{f(b) - f(x)}{b - x} = \lim_{b \to x} \frac{(2b+1) - (2x+1)}{b - x} = \lim_{b \to x} \frac{2b - 2x}{b - x}$$

$$= \lim_{b \to x} \frac{2\cancel{(b-x)}}{\cancel{(b-x)}} = \lim_{b \to x} 2 = \boxed{2}.$$

2. Determine the sign (+, – or 0) of f, f' and f'' at each point shown in the graph of $y = f(x)$.
(9 correct: 5 pts, 7-8 correct : 4 pts, 5-6 correct: 3 pts, 3-4 correct: 2 pts, 1-2 correct: 1 pt)

	f	f'	f''
A	–	0	–
B	–	–	+
C	+	+	0



3. Estimate $f(19)$ when the function $y = f(x)$ satisfies $f(21) = 3$ and $f'(21) = -2$.

$$f(19) \approx f'(21) \cdot (19 - 21) + f(21)$$
$$= -2 \cdot (-2) + 3$$
$$= 4 + 3$$
$$= \boxed{7}$$

4. (Bonus problem, 1 pt) If $y = f(x)$ is a continuous function with properties $f'(x) > 0$ and $f''(x) = 0$ for all x, then what is a possible graph of $y = f(x)$? Determine the shape of the graph as, for example, a parabola, a line, a snake-shaped one, etc....and sketch it with considering the concavity and the increasing/decreasing property.

$f'(x) > 0 \Rightarrow f$ is increasing
$f''(x) = 0 \Rightarrow$ no concavity.
So not curved at all
$\Rightarrow$ increasing line