Math 1203 Quiz 7
March 5, 2019

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Name: ANSWERS

Instructions: No calculators! Answer all problems in the space provided! Do your rough work on scrap paper.

1. Define $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ (using limits)

2. Let $f(x) = 2 - x^2$.
   (a) Use the limit definition of the derivative to find $f'(x)$. Show your work!

$$f'(x) = \lim_{h\to 0} \frac{2-(x+h)^2-(2-x^2)}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{2}-\cancel{x^2}-2xh-h^2-\cancel{2}+\cancel{x^2}}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{h}(-2x-h)}{\cancel{h}}$$

$$= \lim_{h\to 0} (-2x-h)$$

$$= \boxed{-2x}$$

3 points
- 1 pt for set up
- 1 pt for correct notation and steps (including writing "$\lim_{h\to 0}$" every time until limit is taken).
- 1 pt for final answer.

   (b) Find the equation of the tangent line to $f(x)$ at the point where $x = 1$. $y-1=-2(x-1)$ OR $y = -2x+3$

3. Complete the table:

Function (assume all are continuous everywhere)	**The behavior it tells us about**	**How?**
$f(x)$	**Points on the graph**	**Plug in x into f(x), find corresponding y-value to get (x,y)**
$f'(x)$	The function is increasing	$f'(x) > 0$
$f''(x)$	**The function is Concave down**	$f''(x) < 0$
$f'(x)$	**The function is decreasing**	$f'(x) < 0$

Bonus:

1. Complete the following rules:
   (a) $\frac{d}{dx}(f(x)\cdot g(x)) = f'\cdot g + f\cdot g'$ (b) $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'\cdot g - f\cdot g'}{g^2}$
   (c) $\frac{d}{dx} f(g(x)) = f'(g(x))\cdot g'(x)$ (d) $\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$