Math 205 Quiz 3
June 16, 2016

Name: ANSWERS

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

1. Find the equation of the line that passes through the point $(3,-5)$ and (i) has slope -4 $y=-4x+7$

   or (ii) is perpendicular to $2x-4y=3$ $y=-2x+1$

2. Suppose $f(x)$ is differentiable at x (its derivative exists there), define: $f'(x)=$ $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

3. If $f(x)=2x^2-x+4$ and $g(x)=3x-1$, find:

   (a) $f\circ g=$ $18x^2-15x+7$ (b) $g\circ f=$ $6x^2-3x+11$

4. Find the domains of the following functions in interval notation:

   (a) $f(x)=\frac{2x+1}{x^2-x-2}$ $D:$ $(-\infty,-1)\cup(-1,2)\cup(2,\infty)$ $g(x)=\frac{\sqrt{3-x}}{\sqrt{1-x^2}}$ $D:$ $(-1,1)$

5. For $f(x)=\sqrt{x}$, find and simplify the difference quotient: $\frac{1}{\sqrt{x+h}+\sqrt{x}}$

6. For $f(x)=\frac{1}{x}$, find the average rate of change between $x=1$ and $x=2$: $f_{avg}=$ $-1/2$

7. Use limits to find the derivative of $f(x)=2-x-x^2$ by doing the following:

   The expression just before taking the limit: $-2x-1-h$ Final answer: $-2x-1$

8. Compute the following limits:

   (a) $\lim_{h\to 0}\frac{\frac{1}{(x+h)^2}-\frac{1}{x^2}}{h}=$ $-\frac{2}{x^3}$

   (b) $\lim_{x\to 9}\frac{3x-27}{|x-9|}=$ DNE

   (c) $\lim_{t\to\infty}\frac{(2t^2+1)^2}{(t+1)^2(t^2+t)}=$ 4

   (d) $\lim_{x\to-\infty}\frac{4x^2+9x^3}{5-3x^3}=$ -3

9. (a) Let $f(x)=2x^2+1$, compute $\lim_{h\to 0}\frac{f(2+h)-f(2)}{h}=$ 8

   (b) Interpret what the answer to part (a) means: The slope/derivative of $f(x)$ at $x=2$ is 8

Bonus:

1. With an equation, define "$f(x)$ is continuous at $x=a$": $\lim_{x\to a} f(x)=f(a)$

2. In terms of derivatives, describe the following:

   (a) $f(x)$ is increasing: $f'(x)>0$

   (b) $f(x)$ is concave down: $f''(x)<0$