Math 121 S10N03 - Quiz 2
Jan 19 2010

Name: SOLUTIONS
Stu#:

(1) [7 points] Let $f(x) = x + \dfrac{1}{x}$ and $g(x) = \dfrac{x+2}{x+3}$.

(i) Determine and simplify $(f \circ g)(x)$.

(ii) Determine the domain of $(f \circ g)(x)$.

(i)
$$(f \circ g)(x) = f(g(x))$$
$$= g(x) + \frac{1}{g(x)}$$
$$\left.= \frac{x+2}{x+3} + \frac{1}{\left(\frac{x+2}{x+3}\right)} \right\} *$$
$$= \frac{x+2}{x+3} + \frac{x+3}{x+2}$$
$$= \frac{(x+2)^2 + (x+3)^2}{(x+3)(x+2)}$$
$$= \frac{x^2+4x+4 + x^2+6x+9}{(x+3)(x+2)}$$
$$= \frac{2x^2+10x+13}{(x+3)(x+2)}.$$

(ii) Using (*), domain of $f \circ g$ is all real x <u>excluding</u> $x = -3$, $x = -2$, i.e. $(-\infty,-3) \cup (-3,-2) \cup (-2,\infty)$.

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(2) [8 points] Neatly sketch the graph of a function $f(x)$ which satisfies the following properties (there are many possible correct answers):

$$\lim_{x\to 1} f(x) = 3, \quad \lim_{x\to 4^-} f(x) = 3, \quad \lim_{x\to 4^+} f(x) = -3, \quad f(1) = 1, \quad f(4) = -1$$