The University of Calgary
Department of Mathematics and Statistics
MATH 249-01
Quiz # 2W

Fall,2006

Name:______________________________**I.D.#:**____________________

1. For $f(x) = \sqrt{4-x}$ and $g(x) = \dfrac{3}{1-x}$ find $f \circ g$ and its domain. [3]

2. For $f(x) = \dfrac{3-\sqrt{2x-1}}{x-5}$ find $\lim f(x)$ as

   (a) $x \to 5$

   (b) $x \to -\infty$

   (c) $x \to +\infty$ [4]

3. For $g(x) = \dfrac{x^2+x-6}{x-3x^2}$ find $\lim g(x)$ as

   (a) $x \to 0^+$

   (b) $x \to +\infty$ [3]

SOLUTION

For 1)

domains $D_f = \{x \leq 4\}$ $D_g = \{x \neq 1\}$

$$f \circ g(x) = f(g(x)) = \sqrt{4-(g(x))} = \sqrt{4-(\frac{3}{1-x})} = \sqrt{\frac{4-4x-3}{1-x}} = \sqrt{\frac{1-4x}{1-x}}$$

we cannot have 0 in the denom $x \neq 1$ and $\dfrac{1-4x}{1-x} > 0$

split points $x-1, \frac{1}{4}$

testing $-^{pos} - -_{\frac{1}{4}} - -^{neg} - -_{1} - -^{pos} - -$

together $D_{f \div g} = \left(-\infty, \frac{1}{4}\right] \cup (1, +\infty)$

For 2a)

for $x \geq \frac{1}{2}$ and $x \neq 5$ simplify

$$.f(x) = \frac{3-\sqrt{2x-1}}{x-5} \cdot \frac{3+\sqrt{2x-1}}{3+\sqrt{2x-1}} = \frac{3^2 - \left(\sqrt{2x-1}\right)^2}{(x-5)\left(3+\sqrt{2x-1}\right)} = \frac{10-2x}{(x-5)\left(3+\sqrt{2x-1}\right)} =$$
$$\frac{-2}{\left(3+\sqrt{2x-1}\right)}$$

so for a) $\lim_{x \to 5^-} f(x) = \dfrac{-2}{6}$

for b) the limit DNE since no values for $x < 0$;

for c) from the simplified from "$\frac{-2}{\infty}$" $= 0$

For 3)

the function $g(x) = \dfrac{x^2 + x - 6}{x - 3x^2}$ is defined only for $x \neq 0, \frac{1}{3}$

for a) the type is"$\frac{-6}{0^+}$" $= -\infty$ since $g(x) = \dfrac{x^2 + x - 6}{x(1 - 3x)}$

in **b**)the limit is "$\frac{\infty}{\infty}$"so : $g(x) = \dfrac{x^2 + x - 6}{x - 3x^2} \cdot \dfrac{\frac{1}{x^2}}{\frac{1}{x^2}} = \dfrac{1 + \frac{1}{x} - \frac{6}{x^2}}{\frac{1}{x} - 3} \to \dfrac{1}{-3} = \dfrac{-1}{3}$