Name: Richard

MATH 200 – Quiz 3 ♞

January 31, 2013

1. $\lim\limits_{x\to 0} \frac{\tan x}{3x} = \lim\limits_{x\to 0} \frac{\frac{\sin x}{\cos x}}{3x} = \lim\limits_{x\to 0} \frac{\frac{\sin x}{\cos x}}{\frac{3x}{1}} = \lim\limits_{x\to 0} \frac{\sin x}{\cos x} \frac{1}{3x} = \lim\limits_{x\to 0} \frac{\sin x}{x} \frac{1}{3\cos x}$

$= \lim\limits_{x\to 0} \frac{\sin x}{x} \cdot \lim\limits_{x\to 0} \frac{1}{3\cos x} = 1 \cdot \frac{1}{3\cos 0} = 1 \cdot \frac{1}{3 \cdot 1} = \boxed{\frac{1}{3}}$

2. Find the indicated one-sided limits.

(a) $\lim\limits_{x\to 1^+} \frac{2x-2}{|x-1|} = \lim\limits_{x\to 1^+} 2\frac{x-1}{|x-1|} = \lim\limits_{x\to 1^+} 2 \cdot 1 = \boxed{2}$

$\frac{x-1}{|x-1|} = 1$ when $x > 1$

(b) $\lim\limits_{x\to 1^-} \frac{2x-2}{|x-1|} = \lim\limits_{x\to 1^-} 2\frac{x-1}{|x-1|} = \lim\limits_{x\to 1^-} 2(-1) = \boxed{-2}$

$\frac{x-1}{|x-1|} = -1$ when $x < 1$

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1. $\lim\limits_{x\to 1} \frac{\sin(2x-2)}{x-1} = \lim\limits_{x\to 1} 2\frac{\sin(2x-2)}{2x-2} = 2 \lim\limits_{x\to 1} \frac{\sin(2x-2)}{2x-2} = 2 \cdot 1 = \boxed{2}$

Note $2x-2 \to 0$ as $x \to 1$

2. Find the indicated one-sided limits.

(a) $\lim\limits_{x\to 0^+} \frac{|x|}{4x} = \frac{1}{4} \lim\limits_{x\to 0^+} \frac{|x|}{x} = \frac{1}{4} \lim\limits_{x\to 0^+} 1 = \frac{1}{4} \cdot 1 = \boxed{\frac{1}{4}}$

Note: $\frac{|x|}{x} = 1$ when $x > 0$

(b) $\lim\limits_{x\to 0^-} \frac{|x|}{4x} = \frac{1}{4} \lim\limits_{x\to 0^-} \frac{|x|}{x} = \frac{1}{4} \lim\limits_{x\to 0^-} (-1) = \frac{1}{4}(-1) = \boxed{-\frac{1}{4}}$

Note: $\frac{|x|}{x} = -1$ when $x < 0$

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MATH 200 – Quiz 3 ♜

January 31, 2013

1. $\lim_{x\to 0}\frac{2x}{\sin(3x)} = \frac{2}{3}\lim_{x\to 0}\frac{3x}{\sin(3x)} = \frac{2}{3}\lim_{x\to 0}\frac{1}{\frac{\sin(3x)}{3x}} = \frac{2}{3}\,\frac{1}{1} = \boxed{\frac{2}{3}}$

Note: $3x \to 0$ as $x \to 0$

2. Find the indicated one-sided limits.

(a) $\lim_{x\to 3^+}\frac{3x-9}{|x-3|} = \lim_{x\to 3^+} 3\,\frac{x-3}{|x-3|} = \lim_{x\to 3^+} 3\cdot 1 = \boxed{3}$

Note: $\frac{x-3}{|x-3|} = 1$ when $x > 3$

(b) $\lim_{x\to 3^-}\frac{3x-9}{|x-3|} = \lim_{x\to 3^-} 3\,\frac{x-3}{|x-3|} = \lim_{x\to 3^-} 3\cdot(-1) = \boxed{-3}$

Note: $\frac{x-3}{|x-3|} = -1$ when $x < 3$

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MATH 200 – Quiz 3 ♛

January 31, 2013

1. $\lim_{x\to 0}\frac{\sin(x)}{\sin(2x)} = \lim_{x\to 0}\frac{\sin(x)}{x}\,\frac{x}{\sin(2x)} = \lim_{x\to 0}\frac{\sin(x)}{x}\,\frac{2x}{\sin(2x)}\,\frac{1}{2}$

$= \lim_{x\to 0}\frac{\sin(x)}{x}\,\frac{1}{\frac{\sin(2x)}{2x}}\,\frac{1}{2} = (1)\,\frac{1}{1}\,\frac{1}{2} = \boxed{\frac{1}{2}}$

2. Find the indicated one-sided limits.

(a) $\lim_{x\to 0^+}\frac{2x}{|x|} = 2\lim_{x\to 0^+}\frac{x}{|x|} = 2\lim_{x\to 0^+}(1) = 2\cdot 1 = \boxed{2}$

Note: $\frac{x}{|x|} = 1$ when $x > 0$

(b) $\lim_{x\to 0^-}\frac{2x}{|x|} = 2\lim_{x\to 0^-}\frac{x}{|x|} = 2\lim_{x\to 0^-}(-1) = 2\cdot(-1) = \boxed{-2}$

Note: $\frac{x}{|x|} = -1$ when $x < 0$