Name: ______________________________

Quiz 20

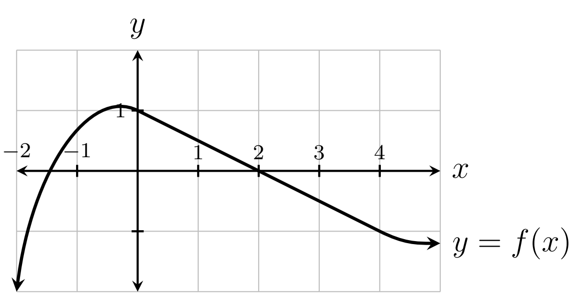
MATH 200
April 12, 2022

1. $$\underset{\substack{\uparrow \\ \frac{\infty}{\infty}}}{\lim_{x\to 0} \frac{2+4\ln|x|}{x+3\ln|x|}} = \underset{\substack{\uparrow \\ \frac{\infty}{\infty}}}{\lim_{x\to 0} \frac{0+\frac{4}{x}}{1+\frac{3}{x}}} = \lim_{x\to 0} \frac{-\frac{4}{x^2}}{-\frac{3}{x^2}} = \lim_{x\to 0} \frac{4}{3} = \boxed{\frac{4}{3}}$$

2. $$\underset{\substack{\uparrow \\ \infty\cdot 0}}{\lim_{x\to\infty} x\tan\left(\frac{1}{x}\right)} = \underset{\substack{\uparrow \\ \frac{0}{0}}}{\lim_{x\to\infty} \frac{\tan\left(\frac{1}{x}\right)}{\frac{1}{x}}} = \lim_{x\to\infty} \frac{\sec^2\left(\frac{1}{x}\right)\left(-\frac{1}{x^2}\right)}{-\frac{1}{x^2}} = \lim_{x\to\infty} \sec^2\left(\frac{1}{x}\right) = \sec^2(0) = \boxed{1}$$

3. $$\underset{\substack{\uparrow \\ \infty-\infty}}{\lim_{x\to 0^+} \big(\ln(\sin(x)) - \ln(x)\big)} = \lim_{x\to 0^+} \ln\left(\frac{\sin(x)}{x}\right) = \ln\left(\underset{\substack{\uparrow \\ \frac{0}{0}}}{\lim_{x\to 0^+} \frac{\sin(x)}{x}}\right) = \ln\left(\lim_{x\to 0^+} \frac{\cos(x)}{1}\right) = \ln(1) = \boxed{0}$$

4. Given the function $f(x)$ graphed below, find $\underset{\substack{\uparrow \\ \frac{0}{0}}}{\lim_{x\to 2} \frac{f(x)}{5x^2-20}} = \lim_{x\to 2} \frac{f'(x)}{10x-0} = \frac{f'(2)}{10\cdot 2} = \frac{-1/2}{20} = \boxed{-\frac{1}{40}}$



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1. $$\lim_{x\to\infty} \underset{\substack{\uparrow \\ \frac{\infty}{\infty}}}{\frac{\ln|x|}{x}} = \lim_{x\to\infty} \frac{1/x}{1} = \lim_{x\to\infty} \frac{1}{x} = \boxed{0}$$

2. $$\lim_{x\to\pi} \underset{\substack{\uparrow \\ 0\cdot\infty}}{(x-\pi)\tan(x/2)} = \lim_{x\to\pi} \underset{\substack{\uparrow \\ \frac{0}{0}}}{\frac{x-\pi}{\cot(x/2)}} = \lim_{x\to\pi} \frac{1-0}{-\csc^2(x/2)1/2} = \frac{1}{-\csc^2(\pi/2)1/2} = -2\sin^2(\pi/2) = \boxed{-2}$$

3. $$\lim_{x\to\infty} \underset{\substack{\uparrow \\ \infty-\infty}}{\Big(\ln\left(x^2-1\right) - 2\ln(x)\Big)} = \lim_{x\to\infty}\Big(\ln\left(x^2-1\right) - \ln\left(x^2\right)\Big) = \lim_{x\to\infty} \ln\underset{\substack{\uparrow \\ \frac{\infty}{\infty}}}{\left(\frac{x^2-1}{x^2}\right)} = \lim_{x\to\infty}\ln\left(\frac{2x}{2x}\right) = \ln(1) = \boxed{0}$$

4. Given the function $g(x)$ graphed below, find $$\lim_{x\to 2} \underset{\substack{\uparrow \\ \frac{0}{0}}}{\frac{\ln|5x-9|}{g(x)}} = \lim_{x\to 2} \frac{\frac{5}{5x-9}}{g'(x)} = \frac{\frac{5}{5\cdot 2-9}}{g'(2)} = \frac{\frac{5}{1}}{\frac{1}{2}} = \boxed{10}$$