Name: Richard

QUIZ 20 ♡

MATH 200

November 17, 2021

1. $\lim\limits_{x\to 1} \dfrac{\ln|x|}{x-1} = \lim\limits_{x\to 1} \dfrac{\frac{1}{x}}{1-0} = \dfrac{\frac{1}{1}}{1} = \boxed{1}$

form $\frac{0}{0}$

2. $\lim\limits_{x\to\infty} \dfrac{1+e^x}{e^x-1} = \lim\limits_{x\to\infty} \dfrac{0+e^x}{e^x-0} = \lim\limits_{x\to\infty} \dfrac{e^x}{e^x} = \lim\limits_{x\to\infty} 1 = \boxed{1}$

form $\frac{\infty}{\infty}$

3. $\lim\limits_{x\to\pi/2} \left(\dfrac{\pi}{2}-x\right)\sec(x) = \lim\limits_{x\to\frac{\pi}{2}} \dfrac{\left(\frac{\pi}{2}-x\right)}{\frac{1}{\sec(x)}} = \lim\limits_{x\to\frac{\pi}{2}} \dfrac{\left(\frac{\pi}{2}-x\right)}{\cos(x)}$

form $0\cdot\infty$

form $\frac{0}{0}$

$= \lim\limits_{x\to\frac{\pi}{2}} \dfrac{0-1}{-\sin(x)} = \dfrac{-1}{-\sin(\pi/2)} = \dfrac{-1}{-1} = \boxed{1}$

4. $\lim\limits_{x\to 0} \left(\dfrac{1}{x} - \dfrac{1}{e^x-1}\right) = \lim\limits_{x\to 0} \left(\dfrac{1}{x}\dfrac{e^x-1}{e^x-1} - \dfrac{x}{x}\dfrac{1}{e^x-1}\right)$

$= \lim\limits_{x\to 0} \dfrac{e^x-1-x}{x(e^x-1)} = \lim\limits_{x\to 0} \dfrac{e^x-0-1}{(e^x-1)+xe^x}$

form $\frac{0}{0}$

still form $\frac{0}{0}$

$= \lim\limits_{x\to 0} \dfrac{e^x}{e^x+e^x+xe^x} = \dfrac{e^0}{e^0+e^0+0e^0} = \dfrac{1}{1+1+0} = \boxed{\dfrac{1}{2}}$

Name: Richard

QUIZ 20 ♣

MATH 200
November 17, 2021

1. $\lim_{x\to\pi} \frac{\cos(x)+1}{(x-\pi)^2} = \lim_{x\to\pi} \frac{-\sin(x)+0}{2(x-\pi)} = \lim_{x\to\pi} \frac{-\cos(x)}{2}$

form $\frac{0}{0}$ still form $\frac{0}{0}$

$= \frac{-\cos(\pi)}{2} = \frac{-(-1)}{2} = \boxed{\frac{1}{2}}$

2. $\lim_{x\to 0} \frac{4+2\ln|x|}{5-3\ln|x|} = \lim_{x\to 0} \frac{0+2\cdot\frac{1}{x}}{0-3\cdot\frac{1}{x}} = \lim_{x\to 0} \frac{2}{-3}\frac{\frac{1}{x}}{\frac{1}{x}} = \lim_{x\to 0} -\frac{2}{3} = \boxed{-\frac{2}{3}}$

form $\frac{\infty}{\infty}$

3. $\lim_{x\to\infty} xe^{-x} = \lim_{x\to\infty} \frac{x}{\frac{1}{e^{-x}}} = \lim_{x\to\infty} \frac{x}{e^x} = \lim_{x\to\infty} \frac{1}{e^x} = \boxed{0}$

form $\infty\cdot 0$ form $\frac{\infty}{\infty}$

4. $\lim_{x\to\infty} \left(\ln(x) - \ln(x+1)\right) = \lim_{x\to\infty} \ln\left(\frac{x}{x+1}\right) = \ln\left(\lim_{x\to\infty}\frac{x}{x+1}\right)$

$= \ln\left(\lim_{x\to\infty}\frac{1}{1+0}\right) = \ln(1) = \boxed{0}$

form $\frac{\infty}{\infty}$

Name: Richard | QUIZ 20 ◇ | MATH 200
November 17, 2021

1. $\lim_{x\to 1} \frac{\ln|x|}{4x - x^2 - 3} = \lim_{x\to 1} \frac{\frac{1}{x}}{4 - 2x} = \frac{\frac{1}{1}}{4 - 2\cdot 1} = \boxed{\frac{1}{2}}$

form $\frac{0}{0}$

2. $\lim_{x\to \pi/2} \frac{1+\tan(x)}{1 - 3\tan(x)} = \lim_{x\to \pi/2} \frac{0 + \sec^2(x)}{0 - 3\sec^2(x)} = \lim_{x\to \frac{\pi}{2}} -\frac{1}{3}\frac{\sec^2(x)}{\sec^2(x)}$

$= \lim_{x\to \frac{\pi}{2}} -\frac{1}{3} = \boxed{-\frac{1}{3}}$

form $\frac{\infty}{\infty}$

3. $\lim_{x\to\infty} x\sin\left(\frac{1}{4x}\right) = \lim_{x\to\infty} \frac{\sin\left(\frac{1}{4x}\right)}{\frac{1}{x}} = \lim_{x\to\infty} \frac{\cos\left(\frac{1}{4x}\right)\left(\frac{-1}{4x^2}\right)}{\frac{-1}{x^2}}$

form $\infty \cdot 0$

form $\frac{0}{0}$

$= \lim_{x\to\infty} \frac{1}{4}\cos\left(\frac{1}{4x}\right)$

$= \frac{1}{4}\cos(0) = \boxed{\frac{1}{4}}$

4. $\lim_{x\to\infty} \Big(\ln(x) - \ln(x+1)\Big) =$

$= \lim_{x\to\infty} \ln\left(\frac{x}{x+1}\right) = \ln\left(\lim_{x\to\infty} \frac{x}{x+1}\right)$

form $\frac{\infty}{\infty}$

$= \ln\left(\lim_{x\to\infty} \frac{1}{1+0}\right) = \ln(1) = \boxed{0}$

Name: *Richard* QUIZ 20 ♠ MATH 200

November 17, 2021

1. $\lim\limits_{x\to 1}\dfrac{e^x-e}{x^2-1} = \lim\limits_{x\to 1}\dfrac{e^x-0}{2x-0} = \dfrac{e^1}{2\cdot 1} = \boxed{\dfrac{e}{2}}$

form $\frac{0}{0}$

2. $\lim\limits_{x\to\infty}\dfrac{\ln|x|}{\sqrt{x}} = \lim\limits_{x\to\infty}\dfrac{\frac{1}{x}}{\frac{1}{2\sqrt{x}}} = \lim\limits_{x\to\infty}\dfrac{2\sqrt{x}}{x} = \lim\limits_{x\to\infty}\dfrac{2\sqrt{x}}{\sqrt{x}\sqrt{x}}$

form $\frac{\infty}{\infty}$

$= \lim\limits_{x\to\infty}\dfrac{2}{\sqrt{x}} = \boxed{0}$

3. $\lim\limits_{x\to 0} x\csc(x) = \lim\limits_{x\to 0}\dfrac{x}{\frac{1}{\csc(x)}} = \lim\limits_{x\to 0}\dfrac{x}{\sin(x)} = \lim\limits_{x\to 0}\dfrac{1}{\cos(x)}$

form $0\cdot\infty$

form $\frac{0}{0}$

$= \dfrac{1}{\cos(0)} = \boxed{1}$

4. $\lim\limits_{x\to\infty}\Big(2\ln(x)-\ln(x^2+1)\Big) = \lim\limits_{x\to\infty}\Big(\ln(x^2)-\ln(x^2+1)\Big)$

form $\infty-\infty$

$= \lim\limits_{x\to\infty}\ln\left(\dfrac{x^2}{x^2+1}\right) = \ln\left(\lim\limits_{x\to\infty}\dfrac{x^2}{x^2+1}\right)$

form $\frac{\infty}{\infty}$

$= \ln\left(\lim\limits_{x\to\infty}\dfrac{2x}{2x+0}\right) = \ln\left(\lim\limits_{x\to\infty}\dfrac{2}{2}\right) = \ln(1) = \boxed{0}$

form $\frac{\infty}{\infty}$