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QUIZ 20

MATH 200
November 6, 2025

1. $\lim_{x\to\pi} \dfrac{1+\cos(3x)}{(x-\pi)^2} =$

$\lim_{x\to\pi} \dfrac{0-3\sin(3x)}{2(x-\pi)} = \lim_{x\to\pi} \dfrac{-9\cos(3x)}{2}$

form $\dfrac{1+\cos(3\pi)}{(\pi-\pi)^2}$ $= \dfrac{1-1}{0^2} = \dfrac{0}{0}$

still form $\dfrac{0}{0}$

$= \dfrac{-9\cos(3\pi)}{2}$

$= \dfrac{(-9)(-1)}{2} = \boxed{\dfrac{9}{2}}$

2. $\lim_{x\to\infty} x\sin\left(\dfrac{1}{x}\right) =$

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

form $\infty\cdot\sin(0)$ $= \infty\cdot 0$

form $\dfrac{0}{0}$

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

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

$= \cos(0)$

$= \boxed{1}$

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1. $\lim_{x\to 1} \dfrac{e^x - ex}{x^2 - 2x + 1} =$

$$\lim_{x\to 1} \frac{e^x - e}{2x-2} = \lim_{x\to 1} \frac{e^x}{2} = \frac{e^1}{2}$$

form $\frac{0}{0}$

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

$$= \boxed{\frac{e}{2}}$$

2. $\lim_{x\to 0} 5x\cot(3x) =$

$$\lim_{x\to 0} \frac{5x}{\frac{1}{\cot(3x)}} = \lim_{x\to 0} \frac{5x}{\tan(3x)}$$

form $0\cdot\infty$

form $\frac{0}{0}$

$$= \lim_{x\to 0} \frac{5}{\sec^2(3x)\cdot 3}$$

$$= \frac{5}{3(\sec(0))^2}$$

$$= \frac{5}{3\cdot 1^2}$$

$$= \boxed{\frac{5}{3}}$$