Name: Richard

QUIZ 3 ♡

MATH 200
September 7, 2022

1. $\lim_{x\to 0} \frac{\tan(x)}{x} = \lim_{x\to 0} \frac{\frac{\sin(x)}{\cos(x)}}{\frac{x}{1}} = \lim_{x\to 0} \frac{\sin(x)}{x\cos(x)} = \lim_{x\to 0} \frac{1}{\cos(x)} \frac{\sin(x)}{x}$

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

2. $\lim_{x\to 1} \log_2\left(\frac{x^2-1}{4x-4}\right) = \log_2\left(\lim_{x\to 1} \frac{\cancel{(x-1)}(x+1)}{4\cancel{(x-1)}}\right) = \log_2\left(\lim_{x\to 1} \frac{x+1}{4}\right)$

$= \log_2\left(\frac{1+1}{4}\right) = \log_2\left(\frac{1}{2}\right) = \boxed{-1}$

3. $\lim_{x\to \pi} e^{\sin(x)} = e^{\lim_{x\to\pi} \sin(x)} = e^{\sin(\pi)} = e^0 = \boxed{1}$

4. State the intervals on which the function $f(x) = \sqrt{\tan^{-1}(x)}$ is continuous.

By building-up Theorem, This function is continuous on its domain which is

$\boxed{[0, \infty)}$

((These are the values for which $\tan^{-1}(x)$ is positive)

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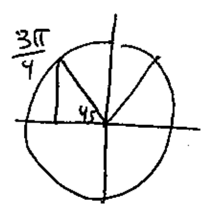
1. $\lim_{x\to 0} \frac{\pi \sin(x)}{4x} = \lim_{x\to 0} \frac{\pi}{4} \frac{\sin(x)}{x} = \frac{\pi}{4} \lim_{x\to 0} \frac{\sin(x)}{x} = \frac{\pi}{4} \cdot 1 = \boxed{\frac{\pi}{4}}$

2. $\lim_{x\to 0} \log_2 (e^x + 15) = \log_2 \left(\lim_{x\to 0} (e^x + 15) \right) = \log_2 (e^0 + 15)$

$= \log_2 (1 + 15) = \log_2 (16) = \boxed{4}$

3. $\lim_{x\to 4} \cos\left(\frac{3\pi}{x}\right) = \cos\left(\lim_{x\to 4} \frac{3\pi}{4} \right) = \cos\left(\frac{3\pi}{4}\right) = \boxed{-\frac{\sqrt{2}}{2}}$



4. State the intervals on which the function $f(x) = \frac{x^2 - 1}{x^2 - x}$ is continuous.

$f(x) = \frac{(x-1)(x+1)}{x(x-1)}$ By building up theorem, this function is continuous on its domain, which is $\boxed{(-\infty, 0) \cup (0, 1) \cup (1, \infty)}$

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QUIZ 3 ♣

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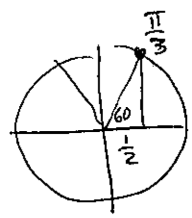
1. $\lim_{x \to 0} \frac{1 - \cos(x)}{x} = \boxed{0}$ (Known formula)

2. $\lim_{x \to \pi/3} 9^{\cos(x)} = 9^{\lim_{x \to \pi/3} \cos(x)} = 9^{\cos(\pi/3)} = 9^{1/2} = \sqrt{9} = \boxed{3}$



3. $\lim_{x \to 2\pi} \log_2 (8 \cos(x)) = \log_2 \left(\lim_{x \to 2\pi} 8 \cos(x) \right)$

$= \log_2 \left(8 \cos(2\pi) \right) = \log_2 (8 \cdot 1) = \log_2 (8) = \boxed{3}$

4. State the intervals on which the function $f(x) = \frac{\sin(x)}{x}$ is continuous.

By the building-up theorem this is continuous on its domain, which is $\boxed{(-\infty, 0) \cup (0, \infty)}$

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QUIZ 3 ♠

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

2. $\lim_{x\to 0} \log_2\left(\frac{4\sin(x)}{x}\right) =$ $\log_2\left(\lim_{x\to 0} \frac{4\sin(x)}{x}\right) = \log_2\left(4\lim_{x\to 0} \frac{\sin(x)}{x}\right)$

$= \log_2(4\cdot 1) = \log_2(4) = \boxed{2}$

3. $\lim_{x\to 0} \cos(\pi e^x) =$ $\lim_{x\to 0} \cos(\pi e^x) = \cos\left(\lim_{x\to 0} \pi e^x\right)$

$= \cos\left(\pi \lim_{x\to 0} e^x\right) = \cos(\pi\cdot e^0) = \cos(\pi\cdot 1)$

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

4. State the intervals on which the function $f(x) = \frac{1}{e^x - 1}$ is continuous.

By the building-up theorem this is continuous on its domain, which is $\boxed{(-\infty, 0)\cup(0,\infty)}$