

Pledge:

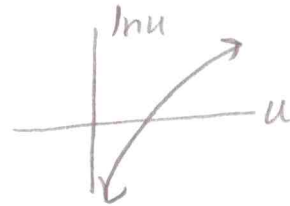
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Dr. Lunsford

MATH261 Calculus I
Quiz 4

Name: Solution
(20 Points Total)

Find the exact value of the following limits (i.e. not a calculator approximation). If the limit does not exist as a real number, please determine if it is possibly infinite. For each limit you must show at least one intermediate step, which can be an explanation in English, for full credit. Clearly indicate your answers. Point credit for each problem is given below the problem.

1. $\lim_{t \rightarrow 3^+} \ln(t^2 - 9) = \lim_{u \rightarrow 0^+} \ln u = \boxed{-\infty}$
(3 points) Let $u = t^2 - 9$
as $t \rightarrow 3^+$, $u \rightarrow 0^+$



2. $\lim_{x \rightarrow \pi^+} \frac{x-4}{\sin x} = \boxed{+\infty}$
(3 points) $\frac{c < 0}{0^-}$
as $x \rightarrow \pi^+$, $x-4 \rightarrow \pi-4 < 0$
and $\sin x \rightarrow 0^-$



3. $\lim_{x \rightarrow 1^+} \sqrt{1-x^2} = \lim_{u \rightarrow 0^-} \sqrt{u} = \boxed{DNE}$
(3 points) Let $u = 1-x^2$
as $x \rightarrow 1^+$, $u \rightarrow 0^-$

4. $\lim_{x \rightarrow \pi} \sin(x + \sin x) = \sin(\pi + \sin \pi) = \sin(\pi) = \boxed{0}$
(3 points)

5. $\lim_{w \rightarrow 2} \tan^{-1}\left(\frac{w^2-4}{4w-2w^2}\right) = \lim_{w \rightarrow 2} \tan^{-1}\left(\frac{(w-2)(w+2)}{-2w(w-2)}\right)$
(4 points) as $w \rightarrow 2$, $\frac{w^2-4}{4w-2w^2} \rightarrow \frac{0}{0}$ indeterminate form
 $= \lim_{w \rightarrow 2} \tan^{-1}\left(\frac{w+2}{-2w}\right)$
 $= \tan^{-1}(-1)$
 $= \boxed{-\frac{\pi}{4}}$

6. $\lim_{x \rightarrow -\infty} e^x \cos x = \boxed{0}$
(4 points)

Hint for #6: What is that cute little theorem you love to hug? $\rightarrow$ The Squeezing Theorem
 $-1 \leq \cos x \leq 1$ for all $x \in \mathbb{R}$
 $-e^x \leq e^x \cos x \leq e^x$ since $e^x > 0$
as $x \rightarrow -\infty$, $-e^x \rightarrow 0$ and $e^x \rightarrow 0$ $\therefore$ by $\nearrow$