Math 1A (7:30am – 8:20am)
Quiz 8 Version A
Fri Mar 11, 2011

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your DeAnza ID number ? ___ ___

SCORE: ___ / 30 POINTS

NO CALCULATORS ALLOWED

SHOW PROPER ALGEBRAIC WORK AND USE PROPER NOTATION

Find the following limits.
Your final answer should be a number, ∞ or $-\infty$. **Write DNE only if none of the other answers apply.**

SCORE: ___ / 18 POINTS

[a] $\lim_{x\to 0^+} \frac{e^{-x}+x-1}{2-x^2-2\cos x}$ $\quad \frac{1+0-1}{2-0-2} \sim \frac{0}{0}$

$= \lim_{x\to 0^+} \frac{-e^{-x}+1}{-2x+2\sin x}$ $\quad \frac{-1+1}{0+0} \sim \frac{0}{0}$

$= \lim_{x\to 0^+} \frac{e^{-x}}{-2+2\cos x}$ $\quad \frac{1}{0^-}$

$= -\infty$

[b] $\lim_{x\to\infty} \frac{x}{\sqrt{x^2+1}}$

L'HÔPITAL'S RULE GOES INTO CIRCLE (SEE 4.4 #71)

$= \lim_{x\to\infty} \frac{x}{\sqrt{x^2}\sqrt{1+\frac{1}{x^2}}}$

$= \lim_{x\to\infty} \frac{\cancel{x}}{\cancel{x}\sqrt{1+\frac{1}{x^2}}}$

$= \frac{1}{\sqrt{1+0}}$

$= 1$

[c] $\lim_{x\to 0^+} (1+\sin 3x)^{\cot x}$ $\quad (1+0)^{\frac{1}{0}} \sim 1^\infty$

$\lim_{x\to 0^+} \ln(1+\sin 3x)^{\cot x}$

$= \lim_{x\to 0^+} \cot x \ln(1+\sin 3x)$ $\quad \infty \cdot 0$

$= \lim_{x\to 0^+} \frac{\ln(1+\sin 3x)}{\tan x}$ $\quad \frac{0}{0}$

$= \lim_{x\to 0^+} \frac{\frac{1}{1+\sin 3x}\cdot 3\cos 3x}{\sec^2 x}$

$= \frac{\frac{1}{1+0}\cdot 3\cdot 1}{1^2} = 3$

$\lim_{x\to 0^+} (1+\sin 3x)^{\cot x} = e^3$

You want to manufacture a cylindrical can that can hold 32π cubic inches. The material for the base and lid is 6 cents per square inch, and the material for the sides is 3 cents per square inch. Find the dimensions of the cheapest possible can. **SCORE: ___ / 12 POINTS**

MINIMIZE C = COST
BY CHANGING r = RADIUS
h = HEIGHT

$$C = 6(2\cdot\pi r^2) + 3(2\pi r h)$$
$$C = 12\pi r^2 + 6\pi r h$$
$$\pi r^2 h = 32\pi$$
$$h = \frac{32}{r^2}$$
$$C = 12\pi r^2 + 6\pi r\left(\frac{32}{r^2}\right)$$
$$C = 12\pi r^2 + 192\pi r^{-1} \qquad r \in (0,\infty)$$
$$C' = 24\pi r - 192\pi r^{-2} \text{ DNE @ } r = 0 \notin (0,\infty)$$
$$= 24\pi r^{-2}(r^3 - 8) = 0 \text{ @ } r = 2$$
$$C(2) = 12\pi(2)^2 + 192\pi(2)^{-1}$$
$$= 48\pi + 96\pi$$
$$= 144\pi$$
$$\lim_{r\to 0^+}(12\pi r^2 + \underset{0+\infty}{192\pi r^{-1}}) = \infty$$
$$\lim_{r\to\infty}(12\pi r^2 + \underset{\infty+0}{192\pi r^{-1}}) = \infty$$

THE CHEAPEST CAN IS 2 IN (RADIUS)
BY 8 IN (HEIGHT)