

Find $\lim_{x \rightarrow 0} \frac{x^2}{1 - 2x^2 - \cos 2x}$. $\frac{0}{0}$

SCORE: ____ / 4 PTS

Your answer should be a number, ∞ , $-\infty$ or DNE (only if the first three answers do not apply).

$\textcircled{1} = \lim_{x \rightarrow 0} \frac{2x}{-4x + 2\sin 2x}$ $\frac{0}{0}$

$\textcircled{1} = \lim_{x \rightarrow 0} \frac{2}{-4 + 4\cos 2x}$ $\frac{2}{0}$

$= -\infty$
 $\textcircled{1} \quad \textcircled{1}$

Find $\lim_{x \rightarrow 0^+} (1 - 4x)^{\cot x}$. 1^∞

SCORE: ____ / 5 PTS

Your answer should be a number, ∞ , $-\infty$ or DNE (only if the first three answers do not apply).

$\lim_{x \rightarrow 0^+} \ln(1 - 4x)^{\cot x}$

$\textcircled{1} = \lim_{x \rightarrow 0^+} \cot x \ln(1 - 4x)$ $\infty \cdot 0$

$\textcircled{1} = \lim_{x \rightarrow 0^+} \frac{\ln(1 - 4x)}{\tan x}$ $\frac{0}{0}$

$\textcircled{1} = \lim_{x \rightarrow 0^+} \frac{\frac{1}{1-4x} \cdot (-4)}{\sec^2 x}$

$= \frac{\frac{1}{1}(-4)}{1} = -4$
 $\textcircled{1}$

$\lim_{x \rightarrow 0^+} (1 - 4x)^{\cot x} = e^{-4}$
 $\textcircled{1}$

Graph $f(x) = (1+e^x)^{-2}$ using the process shown in lecture and in the website handout.

SCORE: ____ / 21 PTS

Complete the table at the bottom of the page, after showing relevant work (except for entries marked ★).

You will NOT receive credit for the entries in the table if the relevant work is missing.

$$f(0) = (1+1)^{-2} = 2^{-2} = \frac{1}{4} \quad \text{y-INT } (0, \frac{1}{4})$$

$\frac{1}{(1+e^x)^2}$ IS NEVER 0

NO x-INT

$$\lim_{x \rightarrow \infty} \frac{1}{(1+e^x)^2} = 0 \quad \left(\frac{1}{(1+\infty)^2} \rightarrow \frac{1}{\infty} \right)$$

$$\lim_{x \rightarrow -\infty} \frac{1}{(1+e^x)^2} = \frac{1}{(1+0)^2} = 1$$

$$f'(x) = \frac{-2e^x}{(1+e^x)^3} \quad \text{IS NEVER UNDEFINED NOR 0}$$

$$f''(x) = \frac{-2e^x(1+e^x)^3 + 2e^x(3(1+e^x)^2)e^x}{(1+e^x)^6}$$

$$= \frac{2e^x(-1-e^x+3e^x)}{(1+e^x)^4}$$

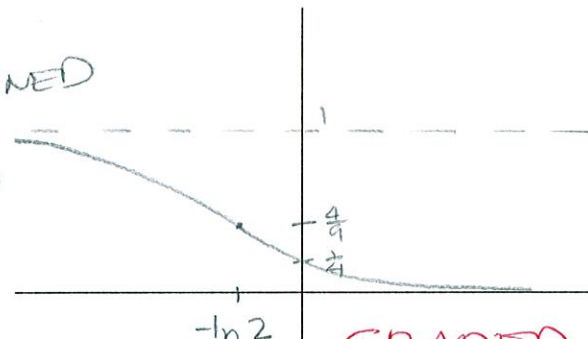
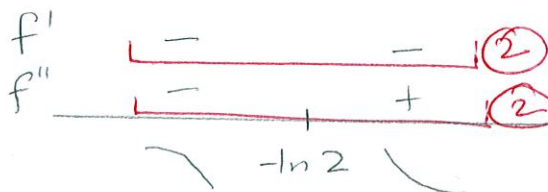
$$= \frac{2e^x(2e^x-1)}{(1+e^x)^4} \quad \text{IS NEVER UNDEFINED}$$

$$= 0 \text{ IF } 2e^x - 1 = 0$$

$$e^x = \frac{1}{2}$$

$$x = \ln \frac{1}{2}$$

$$x = -\ln 2$$



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★ Domain	★ Discontinuities	Intercepts (specify x- or y-)	One sided limits at each discontinuity (write using proper limit notation)	
$\mathbb{R}$ $(1+e^x > 1)$	NONE	y-INT: $(0, \frac{1}{4})$ x-INT: NONE	N/A	
Horizontal Asymptotes	Intervals of Increase	Intervals of Decrease	Intervals of Upward Concavity	Intervals of Downward Concavity
$y = 0, 1$	NONE	$(-\infty, \infty)$	$(0, \infty)$	$(-\infty, 0)$
Vertical Tangent Lines	Horizontal Tangent Lines	Local Maxima	Local Minima	Inflection Points
NONE	NONE	NONE	NONE	$(-\ln 2, \frac{1}{4})$