Find $\lim_{x\to 0}\dfrac{x^2-x^4}{2-x^2-2\cos x}$. $\frac{0}{0}$

**SCORE: _____ / 4 PTS**

**Your answer should be a number, ∞, –∞ or DNE (only if the first three answers do not apply).**

$= \lim_{x\to 0}\dfrac{2x-4x^3}{-2x+2\sin x}$ $\frac{0}{0}$ (1)

$= \lim_{x\to 0}\dfrac{2-12x^2}{-2+2\cos x}$ $\frac{2}{0}$ (1)

$= -\infty$ (1) (1)

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Find $\lim_{x\to 0^+}(1+\sin 4x)^{\cot x}$. $1^\infty$

**SCORE: _____ / 5 PTS**

**Your answer should be a number, ∞, –∞ or DNE (only if the first three answers do not apply).**

$\lim_{x\to 0^+}\ln(1+\sin 4x)^{\cot x}$

$= \lim_{x\to 0^+}\cot x \ln(1+\sin 4x)$ $\infty\cdot 0$ (1)

$= \lim_{x\to 0^+}\dfrac{\ln(1+\sin 4x)}{\tan x}$ $\frac{0}{0}$ (1)

$= \lim_{x\to 0^+}\dfrac{\frac{1}{1+\sin 4x}\cdot 4\cos 4x}{\sec^2 x}$ (1)

$= \dfrac{\frac{1}{1}\cdot 4}{1} = 4$ (1)

$\lim_{x\to 0^+}(1+\sin 4x)^{\cot x} = e^4$ (1)

Graph $f(x) = \dfrac{1}{1+e^{-x}}$ 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.**

$f(0) = \frac{1}{1+1} = \frac{1}{2}$ (½) y-INT $(0, \frac{1}{2})$ (½)

$\frac{1}{1+e^{-x}}$ IS NEVER 0 NO X-INT, (1)

$\lim_{x\to\infty} \frac{1}{1+e^{-x}} = \frac{1}{1+0} = 1$ (1) (½)

$\lim_{x\to-\infty} \frac{1}{1+e^{-x}} = 0$ (½) $\left(\frac{1}{1+\infty} \to \frac{1}{\infty}\right)$ (1)

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

$$f''(x) = \frac{-e^{-x}(1+e^{-x})^2 - e^{-x}(2(1+e^{-x}))(-e^{-x})}{(1+e^{-x})^{4\not 3}}$$

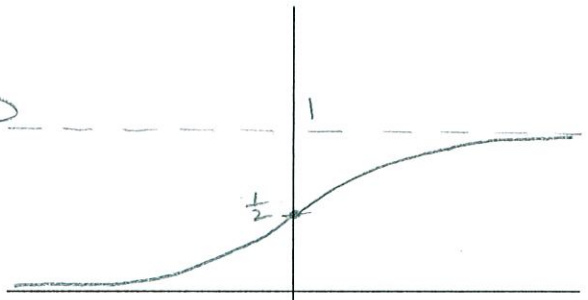
$$= \frac{-e^{-x}(1+e^{-x}-2e^{-x})}{(1+e^{-x})^3}$$

$$= \frac{-e^{-x}(1-e^{-x})}{(1+e^{-x})^3}$$ (2) IS NEVER UNDEFINED

$= 0$ IF $1-e^{-x}=0$

$e^{-x}=1$

$x=0$ (1)

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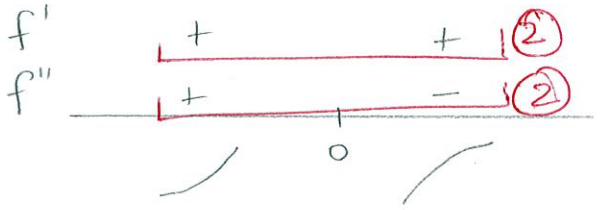


| ★ Domain | ★ Discontinuities | Intercepts (specify $x-$ or $y-$) | One sided limits at each discontinuity (write using proper limit notation) | |
|---|---|---|---|---|
| $\mathbb{R}$ (1) ($1+e^{-x}>1$) | NONE (½) | y-INT: $(0, \frac{1}{2})$ X-INT: NONE | N/A | |
| Horizontal Asymptotes | Intervals of Increase | Intervals of Decrease | Intervals of Upward Concavity | Intervals of Downward Concavity |
| (1) $y=0, 1$ | $(-\infty, \infty)$ | NONE | $(-\infty, 0)$ | $(0, \infty)$ |
| Vertical Tangent Lines | Horizontal Tangent Lines | Local Maxima | Local Minima | Inflection Points |
| NONE | NONE | NONE | NONE | $(0, \frac{1}{2})$ (1) |