NAME: ————————————————————

MAC 2311: Worksheet #13: L'Hopital's Rule 10/27/2015

LECTURE: Statement of L'Hopital's rule for limits of the form $0/0$ and ∞/∞

1) Compute the following limits

a) $\displaystyle\lim_{x\to 0}\frac{1-\cos(5x)}{x^2}$

b) $\displaystyle\lim_{x\to 0}\frac{e^{2x}-1}{\sin(3x)}$

c) $\displaystyle\lim_{x\to +\infty}\frac{\ln(x)}{x}$

d) $\displaystyle\lim_{x\to +\infty}\frac{\ln(x)}{\sqrt{x}}$

e) $\displaystyle\lim_{x\to +\infty}\frac{x}{e^x}$

f) $\displaystyle\lim_{x\to -\infty}\frac{x}{e^x}$

2) A student writes

$$\text{By L'Hôpital's Rule,}\quad \lim_{x\to -2}\frac{x-2}{x^2-2}=\lim_{x\to -2}\frac{1}{2x}=-\frac{1}{4}$$

Are the reasoning and the answer correct? Why? What is the correct answer?

LECTURE: Limits of the form $0\cdot\infty$ and $\infty-\infty$

3) Compute the following limits:

a) $\displaystyle\lim_{x\to\infty}x^3 e^{-x}$

b) $\displaystyle\lim_{x\to 0^+}\tan(x)\ln(x)$

c) $\displaystyle\lim_{x\to +\infty}(\sqrt{x^2+1}-x)$

d) $\displaystyle\lim_{x\to 0^+}\left(\frac{1}{x}-\frac{1}{e^x-1}\right)$

e) $\displaystyle\lim_{x\to +\infty}\left(x-\ln(1+2e^x)\right)$

f) $\displaystyle\lim_{x\to +\infty}(\ln(x)-\ln(1+x))$

LECTURE: Limits of the form 0^0, 1^∞, and ∞^0.

4) Compute the following limits:

a) $\displaystyle\lim_{x\to 0}(e^{2x}-1)^x$

b) $\displaystyle\lim_{x\to 0^+}(-\ln(x))^x$

c) $\displaystyle\lim_{x\to +\infty}\left(1+\frac{a}{x}\right)^{bx}$, where a and b are constants.

PRACTICE PROBLEMS: §3.6 # 1, 3, 4, 7-43odd, 57, 58.