Name Answer Key
Date 2012/2013 Period ____

Calculus Sec 4.5 L'Hospital's Rule extra practice

Evaluate each limit using L'Hospiatl's Rule. State the indeterminate form that justifies its use.

1. $\lim_{x\to 3}\frac{x^2-9}{x-3}$

$\frac{0}{0} \overset{H}{=} \frac{2x}{1} = 6$

2. $\lim_{x\to 0}\frac{x}{e^x-1}$ $\frac{0}{0}$

$\overset{H}{=} \frac{1}{e^x} = 1$

3. $\lim_{x\to -1}\frac{x^6-1}{x^4-1}$ $\frac{0}{0}$

$\frac{6x^5}{4x^3} = \frac{3(-1)}{2(-1)} = \frac{3}{2}$

4. $\lim_{x\to\infty}\frac{\ln x}{x}$ $\frac{\infty}{\infty}$

$\frac{\frac{1}{x}}{1} = \frac{1}{\infty} = 0$

5. $\lim_{x\to\infty}\frac{e^x}{x^3} = \frac{\infty}{\infty}$

$\overset{H}{=} \frac{e^x}{3x^2} = \frac{\infty}{\infty}$

$\overset{H}{=} \frac{e^x}{6x} = \frac{\infty}{\infty}$

$\overset{H}{=} \frac{e^x}{6} = \frac{\infty}{6} = \infty$

6. $\lim_{x\to 0}\frac{e^x-1-x}{x^2}$ $\frac{0}{0}$

$\overset{H}{=} \frac{e^x-1}{2x} = \frac{0}{0}$

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

7. $\lim_{x\to 0}\frac{1-\cos x}{x^2}$ $\frac{0}{0}$

$\overset{H}{=} \frac{\sin x}{2x} = \frac{0}{0}$

$\overset{H}{=} \frac{\cos x}{2} = \frac{1}{2}$

8. $\lim_{x\to 0+}\sqrt{x}\ln x$ $0\cdot-\infty$

$\frac{\ln x}{x^{-1/2}}$

$\overset{H}{=} \frac{\frac{1}{x}}{-\frac{1}{2}x^{-3/2}} = \frac{-2x^{3/2}}{x}$

$= \frac{-2\sqrt{x}}{1} = 0$

9. $\lim_{x\to\infty} e^{-x}\ln x$ $0\cdot\infty$

$\overset{H}{=} \frac{\frac{1}{x}}{e^x} = \frac{1}{xe^x}$

$= \frac{1}{\infty\cdot\infty} = 0$

10. $\lim_{x\to\infty} x^3 e^{-x^2}$ $\infty\cdot 0$

$\frac{x^3}{e^{x^2}} \overset{H}{=} \frac{3x^2}{2xe^{x^2}} = \frac{\infty}{\infty}$

$\overset{H}{=} \frac{3}{4x^2e^{x^2}} = \frac{3}{\infty} = 0$

11. $\lim_{x\to 0+} x\ln x$ $0\cdot-\infty$

$\frac{\ln x}{x^{-1}} \overset{H}{=} \frac{\frac{1}{x}}{-1x^{-2}}$

$\frac{-x^2}{x} = -x = 0$

12. $\lim_{x\to-\infty} xe^x$ $-\infty\cdot 0$

$\frac{x}{e^{-x}} \overset{H}{=} \frac{1}{-e^{-x}}$

$= \frac{1}{-e^{\infty}} = \frac{-1}{\infty} = 0$