

MATH 1850 Sec 011 and 012

CALCULUS I

QUIZ 12

November 23, 2010

Name (Last, First) \_\_\_\_\_

1. Find the limit.

$$\lim_{x \rightarrow \infty} (\ln x)^{\frac{1}{x}}$$

$$\text{Let } y = (\ln x)^{\frac{1}{x}}$$

$$\ln y = \frac{1}{x} \ln(\ln x)$$

$$\lim_{x \rightarrow \infty} \ln y = \lim_{x \rightarrow \infty} \frac{\ln(\ln x)}{x}$$

The right hand side is of the form  $\frac{\infty}{\infty}$ . Apply L'Hôpital's Rule.

$$\ln \lim_{x \rightarrow \infty} y = \lim_{x \rightarrow \infty} \frac{\frac{1}{\ln x} \cdot \frac{1}{x}}{1} = 0$$

$$\text{Therefore } \lim_{x \rightarrow \infty} y = e^0 = 1$$

$$\text{Hence } \lim_{x \rightarrow \infty} (\ln x)^{\frac{1}{x}} = 1$$