

LECTURE NOTES: 4-4 INDETERMINATE FORMS AND L'HOSPITAL'S RULE (PART 3)

WARM UP PROBLEMS: Evaluate the limits below, justifying each step:

a) $\lim_{x \rightarrow 0^+} \frac{\arctan 2x}{x}$

b) $\lim_{x \rightarrow \infty} x \sin(\pi/x)$

QUESTION 1: What does it mean to a limit is an *indeterminate form*?

QUESTION 2: List several forms that *are* indeterminate and several that *are not* indeterminate.

indeterminate

NOT indeterminate

PRACTICE PROBLEMS:

1. $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$

QUESTION 3: Simplify the expressions below:

(a) If $y = a^b$, then $\ln y =$ _____.

(b) If $\lim_{x \rightarrow a} \ln[f(x)] = L$, then $\lim_{x \rightarrow a} f(x) =$ _____.

HINT: *Transform* the functions below by taking the natural logarithm of the expression in the limit (like part(a) above). Evaluate the limit of this transformed expression. Finally, use the answer of the transformed expression to obtain the limit of the original expression (like part (b) above).

2. $\lim_{x \rightarrow \infty} x^{2/x}$

3. $\lim_{x \rightarrow 0^+} (1 + \sin(2x))^{1/x}$