

University of Bahrain
Department of Mathematics
MATHS122: Calculus II
Spring 2016
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Worksheet 2: L'Hopital's Rule

Students' Name: _____

Find the following limits:

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

2. $\lim_{x \rightarrow 0} \frac{x + \sin x}{x + \cos x}$.

3. $\lim_{x \rightarrow \infty} \frac{e^x}{x^n}$ (For any natural number n).

4. $\lim_{x \rightarrow 0^+} x^2 \ln x$.

5. $\lim_{x \rightarrow 0^+} \ln x - \ln \sin x.$

6. $\lim_{x \rightarrow 0} (1 - 2x)^{\frac{1}{x}}.$

$$7. \lim_{x \rightarrow 0} (\cos x) \frac{1}{x^2}.$$

$$8. \lim_{x \rightarrow 0} (x) \frac{1}{\ln x}.$$

9. What happens if you try to use l'Hopital's rule to find the limit? Evaluate the limit using another method

$$\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 + 1}}$$

10. Find $\lim_{x \rightarrow \infty} \sqrt{x^2 + 1} - \sqrt{x}$. (Hint: Multiply and divide by the conjugate!)

11. Use l'Hopital's rule to show that

$$\lim_{x \rightarrow \infty} \left(1 + \frac{n}{x}\right)^x = e^n$$