

MATH 1953 Written Homework 3 (due Wednesday, April 22nd at the BEGINNING of class!)

Please write solutions to these problems on separate sheet(s) of paper (i.e. don't print and write on this assignment.)

1. Use L'Hospital's Rule to find $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$.
2. Take any polynomial $p(x)$ (let's say it's written as $a_n x^n + a_{n-1} x^{n-1} + \dots + a_0$ for some degree n and coefficients a_0, a_1, \dots, a_n .)
 - (a) Explain why $\lim_{x \rightarrow \infty} p(x)$ is ∞ or $-\infty$. (Hint: factor out x^n .)
 - (b) Explain why $\lim_{x \rightarrow \infty} \frac{p(x)}{e^x} = 0$.
 - (c) Explain why $\lim_{x \rightarrow \infty} \frac{\ln x}{p(x)} = 0$.

Based on your answers, what type of function (polynomial, exponential, logarithmic) grows most quickly as $x \rightarrow \infty$? Which grows most slowly?

3. What happens if you try to use L'Hospital's Rule to evaluate $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 1}}{x}$? Evaluate the limit in another way.