CS 581 Homework 2

January 19, 2018

Problem 1.
Consider Stirlings approximation as given by

$$n! \sim \sqrt{2\pi n}(\frac{n}{e})^n \tag{1}$$

What happens to the proportional error in this approximation as n gets large? That is, what is the limit of $(n! - \sqrt{2\pi n}(\frac{n}{e})^n)$ divided by $n!$? (No proof required).

Problem 2.
Prove $n^{\log c} = c^{\log n}$.

Problem 3.
For each pair of expressions (A, B) in the table below, check whether A is O, o , Ω, Θ, $\sim$ (tilda) of B ($\log n$ implies base 2). Use checkmarks where true.

A	**B**	**O**	**o**	Ω	Θ	$\sim$
$\log n$	n					
$\log(2n)$	n					
$\log^2 n$	n					
n^2	$2n^2$					
$n + \log n$	n^2					
n	2^n					
$n^3 + 4n^2 + \log^4 n$	n^3					
$n + \log n$	n					
$\sqrt{n}$	$n^{\sin n}$					
$n!$	n^n					
$\log n!$	$\log n^n$					
$25n \log n + 5n$	$\frac{1}{2} n \log n$					
$\sqrt{n} \log n$	n					
$4^{\log n}$	$2n^2$					
$n \log n$	$n^{1.001}$					