Math and Tree review

Comparing functions asymptotically

- Look at the ratio of the functions

$$\frac{f(n)}{g(n)}$$

- If this ratio gets arbitrarily large, f >> g
- If this ratio gets arbitrarily small, f << g
- If it's bounded, they're asymptotically equal

Recall: Logarithms

$\log_b x$ = "log base b of x"

= power of b that gives x

= number of times you can divide x by b before getting 1

$2^0 = 1$ so $\log_2 1$ is 0

$2^1 = 2$ so $\log_2 2$ is 1

$2^2 = 4$ so $\log_2 4$ is 2 (and $\log_2 3$ is between 1 & 2)

Properties of logarithms

- $\log_b xy = \log_b x + \log_b y$
- $\log_b (x/y) = \log_b x - \log_b y$
- $\log_b x^y = y \log_b x$
- $\log_b a = \dfrac{\log_c a}{\log_c b}$ for any c

Properties of logarithms

- $\log_b xy = \log_b x + \log_b y$
- $\log_b (x/y) = \log_b x - \log_b y$
- $\log_b x^y = y \log_b x$
- $\log_b a = \dfrac{\log_c a}{\log_c b}$ for any c

Order the following from smallest to largest (asymptotically):

n, $2n$, $\log_2 n$, $\log_3 n$, $3^{\log_2 n}$, 2^n, n^2, $n \log_2 6$

Note which are asymptotically the same