CSE 101-02 4-21-22

- Pa3: ext. 1 last day (Saturday)

Pa4: Entry inside Matrix.c

```
typedef struct EntryObj* Entry;
typedef struct EntryObj{

} EntryObj;
```

Handout on Asymptotic Growth

Defn

$f(n) = \Theta(g(n))$ if there exist positive B_1, B_2, n_0 such that

$$B_1 \leq \frac{f(n)}{g(n)} \leq B_2 \quad \text{for} \quad n \geq n_0 .$$

Ex. Let $f(n) = 5n^2 + 11n - 24$, $g(n) = n^2$

Then check that

$$4 \leq \frac{5n^2 + 11n - 24}{n^2} \leq 6$$

for all $n \geq 8$.

$\therefore$ $5n^2 + 11n - 24 = \Theta(n^2)$

note: $an^2+bn+c = \Theta(n^2)$ for any $a, b, c \in \mathbb{R}$ $(a>0)$.

Defn

$f(n) = o(g(n))$ iff $\lim_{n\to\infty} \left(\frac{f(n)}{g(n)}\right) = 0$.

means: $f(n)$ grows strictly slower than $g(n)$.

say: $g(n)$ is a strict asymptotic upper bound for $f(n)$.

Ex.

$f(n) = \ln(n)$, $g(n) = n$. Then

$$\lim_{n\to\infty}\left(\frac{\ln(n)}{n}\right) = \lim_{n\to\infty}\left(\frac{\frac{1}{n}}{1}\right) \quad \text{l'Hop. Rule}$$

$$= \lim_{n\to\infty}\left(\frac{1}{n}\right) = 0$$

so $\ln(n) = o(n)$.