

Till

Jan. 13

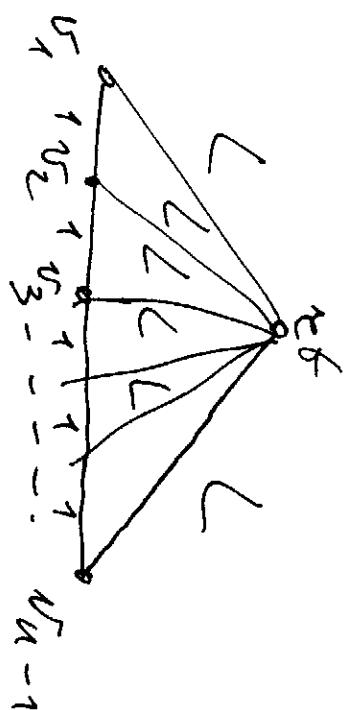
### Assignment #3

Metude Alg's

- 1) For a given  $\varepsilon > 0$ , ( $0 < \varepsilon < \frac{1}{10}$ ),  
choose an Euclidean example  
of an  $n$ -point metric space  
~~of~~  $X$  and a designated  
root vertex  $r$ ,  $r \in X$ , so  
that any spanning tree  $T$   
for  $X$  with root-stretch at  
most  $1 + \varepsilon$  (wrt  $r$ ) will  
have lightness  $L^{(1\varepsilon)}$ .  
Analyze the tradeoff between  
lightness and root-stretch,  
and prove the lower bound.

2)

In the example,



analyze this example for different values of  $L$  between  $1$  and  $n$ .

For each  $L$  in this range, analyze the lightness of the SPT w.r.t  $r$  and the root-stretch of the MST.

3) Consider a path  $\mathcal{Q}$

(a shortest path in a graph  $G$ ), and a  $uv \in \mathcal{Q}$ . Let  $u$  be its projection on  $\mathcal{Q}$ , and  $u'$  be a vertex such that the interval  $[u, u']$  covers  $T_u$ . Let  $v \in T_v$  be a vt.

Show that  $d(u, v) + d(v, u') \leq (1 + O(\varepsilon))d(u, u')$ .

$u_0$

$v$

$u + \frac{v}{c}$

$t$

$\partial$

4) Describe and analyze a tree-repeating scheme that does not employ intervals that enables repeating only from an ancestor to a descendant or from a descendant to an ancestor.

Good luck!

Enjoy!