CECS 528, Learning Outcome Assessment 2, Feb 3rd, Spring 2023, Dr. Ebert

NO NOTES, BOOKS, ELECTRONIC DEVICES, OR INTERPERSONAL COMMUNICATION ALLOWED. Submit each LO solution on a separate, single sheet of paper.

Problem

LO1. Determine the asymptotic growth of the sum

$$\frac{1}{\sqrt[3]{1}} + \frac{1}{\sqrt[3]{2}} + \cdots + \frac{1}{\sqrt[3]{n}}. = \Theta\left(\int_1^n \sqrt[3]{x}\,dx\right) =$$

$$\Theta\left(\frac{3}{2}x^{\frac{2}{3}}\Big|_1^n\right) = \Theta\left(\frac{3}{2}n^{2/3} - \frac{3}{2}\right) = \Theta(n^{2/3})$$

Show all work and justify your approach.

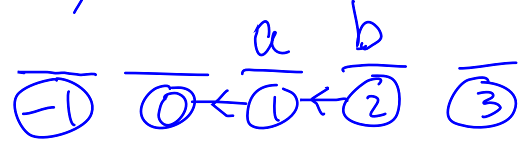
LO2. Recall the use of the disjoint-set data structure for the purpose of improving the running time of the UTS algorithm. For the set of tasks

Task	a	b	c	d	e	f
Deadline	1	2	2	3	3	0
Profit	60	50	40	30	20	10

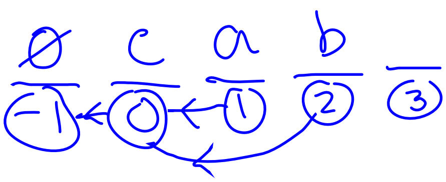
For each task, show the M-Tree forest after it has been inserted (or at least has attempted to be inserted in case the scheduling array is full). Notice that the earliest deadline is 0, meaning that the earliest slot in the schedule array has index 0. Hint: to receivec credit, your solution should show six different snapshots of the M-Tree forest.

ins(a,1):

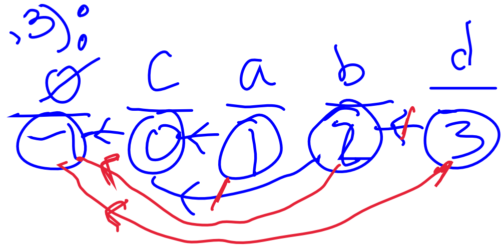
ins(b,2):



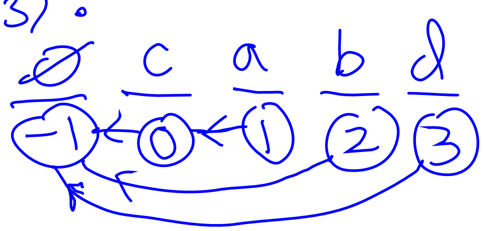
ins(c,2):



ins(d,3):



ins(e,3):



ins(f,0): no change