CLRS Exercise

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1 15

2 15.1-1

$2^n - 1 = \Sigma_{j=0}^{n-1} 2^j$

3 15.1-2

Do not know how!

4 15.1-3

See Code

5 15.1-4

See Code

6 15.1-5

See Code

7 15.2-1

See Code

8 15.2-2

See Code

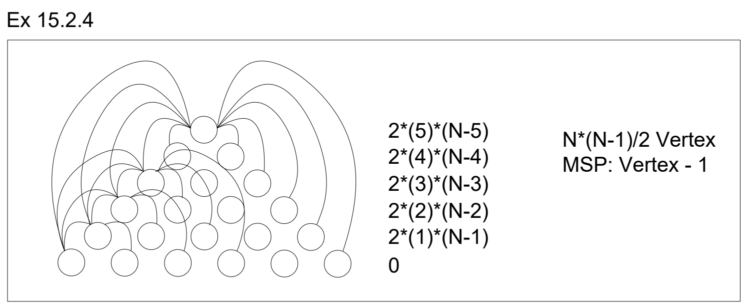

Figure 1: 15.2-4

9 15.2-3

Assume that $\forall k \leq n-1, T(k) \geq c2^k$
Then $T(n) = \Sigma_{k=1}^{n-1} T(k)T(n-k) = (n-1)c^2 2^n > c2^n$
So $T(n) = \Omega(n), \omega(n)$

10 15.2-4

See Figure 1

11 15.2-5

For each level $h(i) = i(n-i)$
For tree $T(n) = 2\Sigma_{i=1}^{n-1} i(n-i)$
$= \frac{3n^3+3n^2}{3} - \frac{2n^3+3n^2+n}{3}$
$= \frac{n^3-n}{3}$

12 15.2-6

Assume that $\forall k \leq n-1, N(k) = k-1$
Then $N(n) = N(n-1) + 1$
So $N(n) = n-1$

13 15.3-1

running through: $T(n) = n * P_n^n = n * n! > 4^n$ running recursion: $T(n) = 2\Sigma_{i=1}^{n-1} 4^i + n = \frac{8}{3} 4^{n-1} + n \leq 4^n$