Homework Assignment 4
CS 330 Discrete Structures
Fall Semester, 2017

Due: Monday, October 23, 2017

1. Solve the following problems using the operator method discussed in class and given in the notes:
   (a) Page 511, exercise 12
   (b) Page 525, exercise 28
   (c) Page 526, exercise 40

   If the roots of the recurrence are not integers, just get the form of the solution in each case for symbolic roots, together with the simultaneous equations that determine the coefficients.

2. Solve the following problems using secondary recurrences together with the operator method discussed in class and given in the notes:
   (a) Page 536, exercise 36
   (b) Derive all three cases of the Master Theorem on page 532 (we did part of this in class).
   (c) In the notes, the recurrence $T(n) = \sqrt{n} \cdot T(\sqrt{n}) + n$ is solved by a recursion tree (page 13 of the notes) and again by the “guess-and-confirm” method in section 1.6.3. Solve it by means of a secondary recurrence (section 1.5.3), together with the operator method.

3. (a) Prove that $\frac{1}{89} = \frac{1}{10^2} + \frac{1}{10^3} + \frac{2}{10^4} + \frac{3}{10^5} + \frac{5}{10^6} + \frac{8}{10^7} + \cdots$. (Hint: $89 = 10^2 - 10 - 1$).
   (b) What reciprocal plays the same role base 8? Prove it.

Just for fun (no credit given), solve the crossword puzzle on the back of this page and explain all of the “theme” words.
Crossword

When this puzzle is done, the 11 circled letters can be connected by a curved line to spell a two-word phrase appropriate to this puzzle’s theme.

**ACROSS**
1. Pipe part
2. Babycakes
3. Paper orders
4. Leonard of (mathematician who wrote about the 33-Across)
5. Out of kilter
6. Have dinner at home
7. Food with a heart
8. Blue-collar worker
9. Popular online lectures about “Ideas worth spreading”
10. Aly’s love interest in a Woody Allen film
11. Father-and-daughter boxers
12. Pres., e.g.
13. Lingus
14. Midsize Kia
15. Cephalopod known for its shell
16. “Now I see!”
17. “Both work for me!”
18. Mathematical sequence related to a pattern found in a 17-, 29-, 42- or 56-Across, informally
19. Sneeze producer
20. Cam button
21. Cochlea locale
22. Honolulu’s ______ Palace
23. “____ man walks into a bar…”
24. No. after a no.
25. Razor brand
26. Sayings of Jesus
27. No longer able to shoot
28. Some waffles
29. Van Gogh subject
30. Link with
31. Sauce that’s made “Old World Style”
32. Singer Bareilles with the 2007 top 10 hit “Love Song”
33. 26-Across, e.g.
34. Ship-to-ship communication

**DOWN**
1. Short row
2. Ring around a rim
3. Cornerstone abbr.
4. Tiki bar staple
6. They thought C-3PO was a god in “Return of the Jedi”
7. Scroll storers
8. Pumpernickel grain
9. Badidge
10. Merit
11. Like much Schoenberg music
12. Surroundings
13. Mocking looks
14. Pacify
15. Homo sapiens, e.g.
16. Stupidity syllables
17. Speaker of stupid syllables
18. Night of poetry
19. Greek letter associated with the 33-Across
20. Web browser subwindow
21. More pleasant
22. Like oddly conjugated verbs: Abbrev.
23. Razzle-dazzle
24. Unbarred, to a bard
25. “Because I felt like it”
26. “A Clockwork Orange” narrator
27. Glass behind a radio microphone
28. Annual subscriptions are available for the best of Sunday crosswords from the last 50 years: 1-888-7-ACROSS.
29. Read about and comment on each puzzle: nytimes.com/wordplay.