Lab March 21, Answer all these questions and turn in the work to D2L by the end of the day (11:59pm) Friday night. You can do them as a partnership (two people max).

Many of these I did in class on Thursday, it’s a review on those questions.

Recurrence Relations – a formula which relates a term in the sequence with a previous term or terms. This directly relates to iteration and especially recursion in programming.

Examples:

• Bn+1 = 2Bn + 5 where n > 0, B1 = -2

B2=2(-2) + 5 = 1

B3=2(1) + 5 = 7

• Bn = 2(5-2Bn-1), where n > 1, B1 = -1

B2 = 2(5 - 2(-1)) = 14

B3 = 2(5 - 2(14)) = -46

• Bn+1 = 1/ (2+ Bn) where n>= 1, B1 = 0

B2 = 1/(2 + 0) = 1/2

B3 = 1/(2+1/2) = 2/5

• Bn = Bn-1 + 4 where n > 1, B1 = 3

B2 = 3 + 4 = 7

B3 = 7 + 4 = 11

For each of the following sequences find expressions for B2 and B3 in terms of *k.*

• Bn = 4Bn-1  + 3k, n > 1, B1 = 1

B2 = 4(1) + 3k = 4 + 3k

B3 = 4(4 + 3k) + 3k = 16 + 15k

• Bn+1 = kBn  + 5, n>0, Bn = 2

B2 = 2k + 5

B3 = k(2k + 5) + 5 = 2k^2 + 5k + 5

A sequence is given by the recurrence relation:

Bn = 1/2 (k + 3Bn-1) , n>1, B1 = 2.

• Find an expression for B3 in terms of the constant k. Given that B3 = 7

B2 = 1/2(k + 6)

B3 = 1/2(k + 3(1/2(k + 6))) = 1/4(5k + 18)

28 = 5k + 18

k = 2

• Find the value of k and the value of B4

k = 2

B4 = 1/2(2 + 3(7)) = 6

For the sequences given by the following recurrence relations find B4  and B1

• Bn = 3Bn-1 – 2, n > 1, B3 = 10

B4 = 3(10) - 2 = 28

10 = 3B2 - 2

4 = B2

4 = 3B1 - 2

2 = B1

A sequence of terms is {tn} is defined for n > 1, by the recurrence relation

Tn = ktn-1 + 2

Where k I s a constant Given that t1 = 1.5

• Find expressions for t2 and t3 in terms of k

t2 = 1.5k + 2

t3 = k(1.5k + 2) + 2 =

t3 = 1.5k^2 + 2k + 2

Given also that t3 = 12

• Find possible values of k

12 = 1.5k^2 + 2k + 2

0 = 1.5k^2 + 2k -10

Quadratic Formula!

(-2 +/- (4 - 4(1.5\*-10))^(1/2))/(3) =

(-2 +/- (64)^(1/2)) / 3 =

(-2 +/- 8) / 3

k = -10/3, 2

In each case, write down a recurrence relation that would produce given sequence:

• 5, 9, 13, 17, 21 …..

Tn = Tn-1 + 4; T1 = 5

• 1, 3, 9, 27, 81 .....

Tn = Tn-1 \* 3; T1 = 1

• 62, 44, 26, 8, -10…..

Tn = Tn-1 - 18; T1 = 62

• 120, 60, 30, 15, 7.5…..

Tn = 1/2(Tn-1); T1 = 120

• 4, 9, 19, 39, 79……

Tn = 2Tn-1 + 1; T1 = 4

• 1, 3, 11, 43, 171……

Tn = 4Tn-1 - 1; T1 = 1