

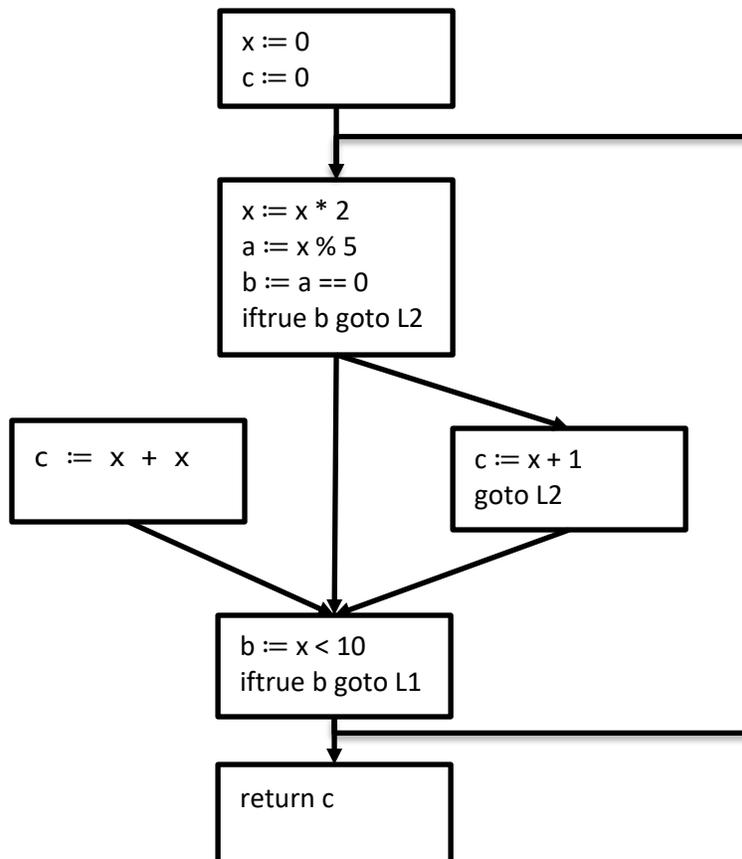
CS 1622 – Homework 5 Answers

Due: Tuesday, April 17, 2018, at the start of class

Please submit a typewritten document. I'd prefer you draw your graphs on the computer, but if this is a challenge, you may hand draw them neatly on the paper by hand.

1.) Identify the basic blocks in the following sequence of IR code and construct the Control Flow Graph:

	1	x := 0
	2	c := 0
L1:	3	x := x * 2
	4	a := x % 5
	5	b := a == 0
	6	iftrue b goto L2
	7	c := x + 1
	8	goto L2
	9	c := x + x
L2:	10	b := x < 10
	11	iftrue b goto L1
	12	return c



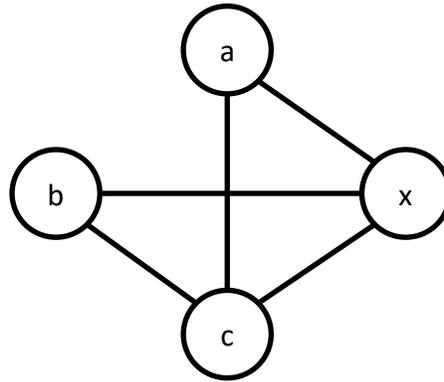
2.) Perform liveness analysis on the variables in the above code statement by statement. Show each iteration of the algorithm in terms of live-in and live-out.

BLOCK	DEF	USE	SUCCESSOR
12		c	
11		b	3, 12
10	b	x	11
9	c	x	10
8			10
7	c	x	8
6		b	7, 10
5	b	a	6
4	a	x	5
3	x	x	4
2	c		3
1	x		2

ITERATION	1		2		3	
	In	Out	In	Out	In	Out
12	c		c		c	
11	b,c	c	b,c,x	c,x	b,c,x	c,x
10	c,x	b,c	c,x	b,c,x	c,x	b,c,x
9	x	c,x	x	c,x	x	c,x
8	c,x	c,x	c,x	c,x	c,x	c,x
7	x	c,x	x	c,x	x	c,x
6	b,c,x	c,x	b,c,x	c,x	b,c,x	c,x
5	a,c,x	b,c,x	a,c,x	b,c,x	a,c,x	b,c,x
4	c,x	a,c,x	c,x	a,c,x	c,x	a,c,x
3	c,x	c,x	c,x	c,x	c,x	c,x
2	x	c,x	x	c,x	x	c,x
1	x		x		x	

3.) Construct the interference graph and perform register allocation using K=3 registers. Show the order that simplify removes the nodes from the graph and then the resulting colors as it is rebuilt.

Construct the interference graph considering for each block the live out and def:



Allocate:

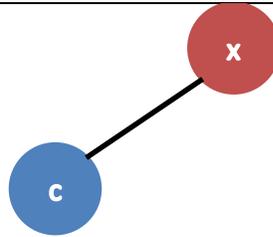
Simplify a	
Simplify b	
Simplify c	
Simplify x	

The graph is empty with no potential spills. Pop them from the simplify stack and assign them a color:

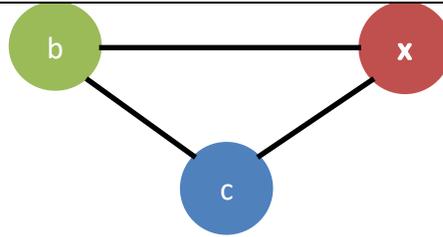
Select x, color red



Select c, color blue



Select b, color green



Select a, color green

