a,b live

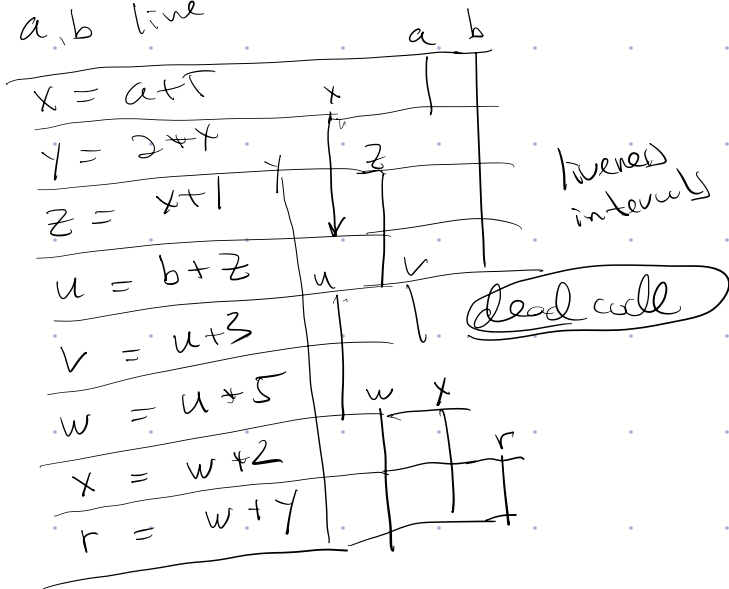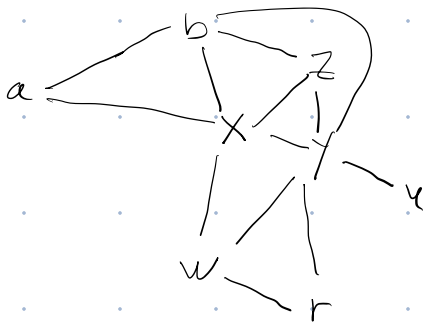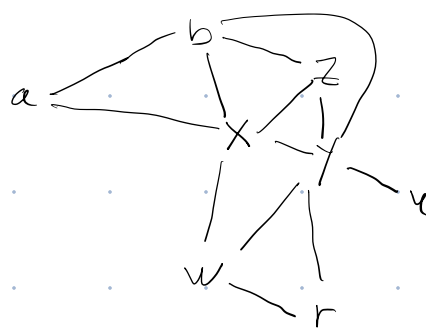|				a	b			
$x = a + r$			x					
$y = 2 + x$		y		z				
$z = x + 1$								
$u = b + z$		u		v				
$v = u + 3$								
$w = u + 5$			w	x				
$x = w + 2$					r			
$r = w + y$								

liveness intervals

(dead code)

r, x live

interference graph

Algorithm to color with $k = 3$ colors
(SIMPLIFY)
① remove each node with $< h$
neighbours and push on a stack
if we color the remaining graph
then we can color that node
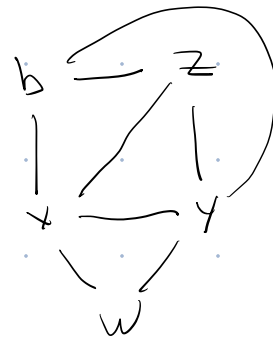For us, a, u, r have < 3
neighbours

Assume we have 3
registers. Can we
"color" the nodes of the
graph with 3 colours
R1, R2, R3
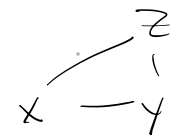So no edge connects nodes
of the same color?

Stack a, u, r

Now w has < 3 edges
so push on stack

Stack a, u, r, w

② **Spill** each node has $\geq k$ edges
So pick one to put in memory

Say b

Memory b
Stack a u r e, b
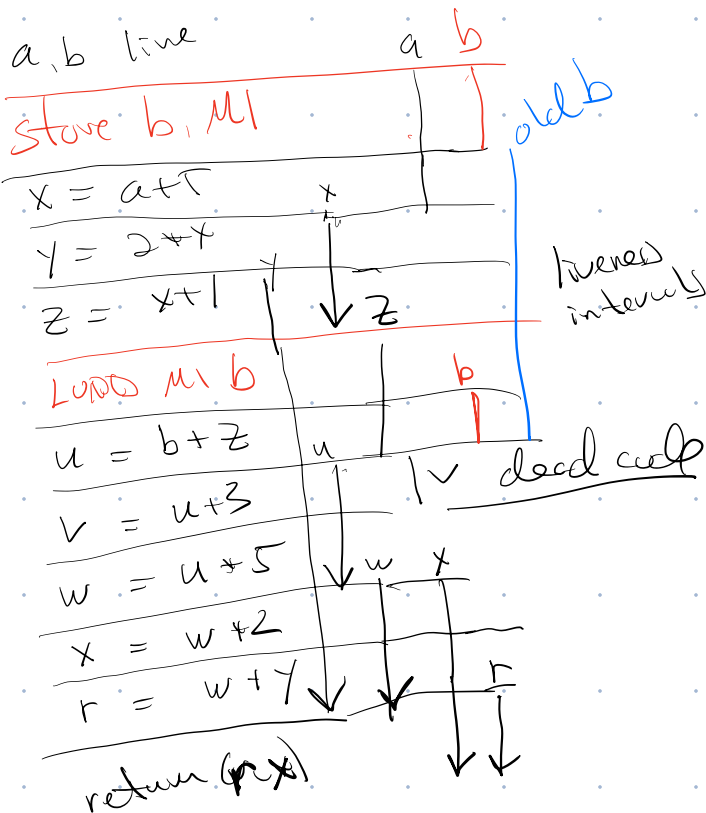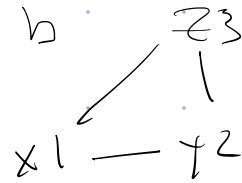
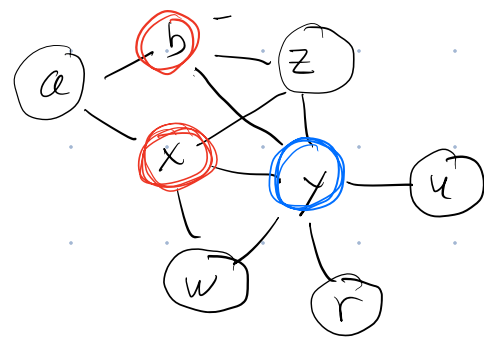$$x - y \quad {\overset{z}{\underset{|}{}}}$$

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③ (Select Colors)

b has no register

So rewrite code w/
b stored in memory
and (Start Over)

$$x_1 - y_2 \quad {\overset{b \quad z_3}{}}$$

Simpler graph ↙

a, b line	a	b
Store b, M1			oldb
$x = a + 7$	x	
$y = 2 * x$	y	
$z = x + 1$	↓z		Liveness intervals
LOAD M1, b		b
$u = b + z$	u		|v dead code
$v = u + 3$		
$w = u + 5$	w x	
$x = w + 2$		
$r = w + y$	r	
return (r, x)		
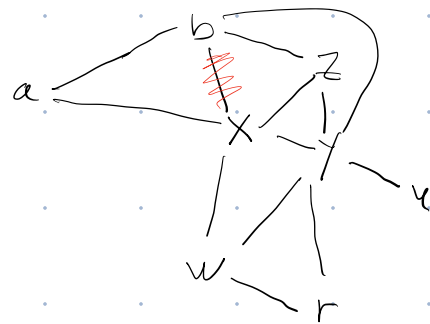
Stack

Simplify a, b, w, r, u, v, y, z

Rebuild graph from stack and
(Select colors)

R1 black
R2 blue
R3 red

Rewrite code onto registers

a in R1
b in R3
Store R3, M1
R3 = R1 + 5
R2 = 2 * R3
R1 = R3 + 1
Load M1, R3
R1 = R3 + R1
    dead code, delete
R1 = R1 + 5
R3 = R1 * 2
R1 = R1 + R2

r in R1
x in R3

a,b live
Store b, M1
x = a + 5
y = 2 + x
z = x + 1
Load M1 b
u = b + z
v = u + 3
w = u + 5
x = w + 2
r = w + y

r, x live

a   b   old b

                liveness
                intervals

z   b

        x   r