1) Show the instances where Data Forwarding is required in a pipelined datapath with the following instructions

```
sub $2, $1, $3
add $12, $2, $5
or $13, $6, $2
add $14, $2, $2
sw $15, 100($2)
```

2) Consider the following MIPS code sequence

```
lw  $t2, 40($t5)
add $t5, $t2, $t8
sub $t3, $t2, $t5
sw $t3, 20($t5)
```

a) *Assuming no forwarding*, identify all pipeline hazards between pairs of instructions

b) *Assuming no forwarding*, insert *stalls* as needed to overcome these hazards. How many clock cycles are needed to finish these instructions?

c) Assuming we use forwarding, insert stalls as needed to overcome these hazards. *How many clock cycles are needed to finish executing these instructions*?