

**Problem 1:** Diagnose or fix the MIPS-I problems below.

(a) Explain why the code fragment below will not complete execution. Fix the problem, assuming that the load addresses are correct. (Problems such as this occur when operating on data prepared on a different system.)

```
lw r1, 0(r2)
lw r3, 6(r2)
```

(b) The code below will execute, but it looks like there might be a bug. Explain.

```
jal subroutine
add r31, r0, r0
```

(c) The two fragments below are almost but not quite MIPS-I. Re-write them using MIPS instructions so they accomplish what the programmer likely intended.

```
# Fragment 1
lw r1, 0(r2+r3)
```

```
# Fragment 2
bgti r1, 101 target
nop
```

(d) The code fragments below are correct, but not as efficient as they could be. Re-write them using fewer instructions (and without changing what they do).

```
# Fragment 1
addi r1, r0, 0xaabb
sll r1, r1, 16
ori r1, r1, 0xccdd
```

```
# Fragment 2
add r1, r0, r0
addi r1, r1, 123
```