

- (e) [6 points] Does the following code correctly instantiate a 4-bit adder? If so, say "Correct". If not, correct the code with minimal modification.

```
1 module adder(input a, input b, input c, output sum, output carry);
2   assign sum = a ^ b ^ c;
3   assign carry = (a&b) | (b&c) | (c&a);
4   endmodule
5
6
7 module adder_4bits(input [3:0] a, input [3:0] b, output [3:0] sum, carry);
8   wire [2:0] s;
9
10  adder u0 (a[0],b[0],1'b0,sum[0],s[0]);
11  adder u1 (a[1],s[0],b[1],sum[1],s[1]);
12  adder u2 (a[2],s[1],b[2],sum[2],s[2]);
13  adder u3 (a[3],s[2],b[3],sum[3],carry);
14  endmodule
```

Yes.

Explanation: Even though the wire *s* is swapped with the input *b*, the final computation produced by the module *adder* is still going to be correct since the *or* and *and* operations are commutative.