(1) (12 points) Say **Exactly** what is printed out by the following program. **Show all intermediate results.** If more than one operation is performed in an expression, write parentheses in to show the precedence (what gets done first), e.g.: $a + b * c$ becomes $a + (b * c)$.

```c
unsigned c;
.
.
c = '\156';


c = c >> 1 | 0XBA - 065;

c %= 64; c <<= 1;

printf("Values are octal %o, decimal %d, and hexacecimal %x.\n", c, c>>1, c);
```

**Answer (PRECISE WORDING):**

(2) (8 points) What is printed out by the following program? **Explain in words what the function func is doing. (DON'T just paraphrase the logic—what's the POINT of the function func?)**

```c
main ( )
{
    int i; char msg [ ] = "XeDZ3a";

    for (i = 1; i < 6; ++i ) /* Careful here ! ! */
        msg[i] = func(msg[i]);
    printf("%s\n", &msg[0]);
}

char func (char c);
{
    if ( 'A' <= c && c <= 'Z')
        return 'Z' - c + 'a';
    else
        return (c+2);
}
```

**Answer1 (WHAT IS PRINTED OUT?):**

**Answer2 (WHAT IS func DOING? Complex: three clauses at least.):**
MU Quiz 1, S10, Solutions

(1) \( c = \text{char}('156') \) in binary: '01'101'1110'. \( c = ((c >> 1) || (\text{0xBA-065})) \), so we start by taking
\( c >> 1 \) gives: '0011'0111'; next, \text{0xBA} is '1011'1010' and \text{065} is '00'110'101'
'1011'1010'
- '0011'0111' and subtract with borrows: 1 from 1 is 0, 1 from 0 is 1 borrowed 1
'1000'0101' so now we need to l this with latest value of c >>1 above:

Alternatively, '1011'1010' = 11*X16 + 10 = 186; \text{065} is 6*X8 + 5 = 53; 185 - 53 = 133. Convert to
binary: 133, 66, 33, 16, 8, 4, 2, 1 And counting backwards for binary gives: '1000'0101'

'1000'0101' so now we need to l this with latest value of c >>1 above:
| 0011'0111'
| '1011'0111' Now c %= 64 ('0100'000'), which leaves bottom 6 bits: '0011'0111'.
(You can convert it to decimal and back to check %= 64 if you want, but this is obvious.)

Now c <<=1 gives '0110'1110' = '01'101'110 or 0156 (octal); now c>>1 is '0011'0111' = 0x37 =
3*16 + 7 = = 55 (decimal); '0110'1110' is 0x6e.

Answer (Precise): Values are octal 156, decimal 55, hexadecimal 6c.

(2) Answer1: (WHAT IS PRINTED OUT?): Xgwa5c (8 points if right; if not but description below gives
right idea, may help point grade.)

Answer 2 (WHAT IS func DOING?): We are modifying msg[i] in a loop starting with i = 1, so the initial
character X in msg[0] never gets changed. Now func(char c) takes upper case characters (if('A' <= c &&
c <= 'Z')) and lowers their case while reversing them in the alphabet (return 'Z' - c + 'a'), so Z goes to a,
Y goes to b, . . ., A goes to z, (D goes to w); if the character is not upper case we add 2, so that e goes
to g, 3 goes to 5, and a goes to c.

Quiz 1 Letter Grade Scaling of Numeric Grades

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<thead>
<tr>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
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<tbody>
<tr>
<td>D</td>
<td>D+</td>
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