

**Name :**

**UID :**

**1.**

Assume:

```
int x = rand(); int y = rand();
unsigned ux = (unsigned) x;
```

Are the following statements always true?

**a.**

`ux >> 3 == ux/8`

**b.** given `x > 0`

`((x << 5) >> 6) > 0`

**c.** `~x + x >= ux`

**d.** given `x & 15 == 11`, `x & 0000...1111 == 0000...1011`

`( ~(x >> 3) & (x >> 2)) << 31) >= 0`

**e.** given `((x < 0) && (x + x < 0))`

`x + ux < 0`

**f.** given `((x < 0) && (y < 0) && (x + y > 0))`

`((x | y) >> 30) == -1`

## 2. Data Lab Practice

Write a function that, given a number `n`, returns another number where the  $k^{\text{th}}$  bit from the right is set to 0.

Examples:

`killKthBit(37, 3) = 33` because `3710 = 1001012 ~> 1000012 = 3310`

`killKthBit(37, 4) = 37` because the 4<sup>th</sup> bit from the right is already 0.

```
int killKthBit(int n, int k) {
```

```
}
```

3.

Given: x has a 4 byte value of 255

0x000000FF

What is the value of the byte with the lowest address in a

a. big endian system?

b. little endian system?

4.

### Endianness

a. Suppose we declared the following 4 byte int:

```
int x = 254;
```

and we stored this in memory location 0x100 on a little-endian system. What values would be stored in the following memory locations?

| 0x100 | 0x101 | 0x102 | 0x103 |
|-------|-------|-------|-------|
|       |       |       |       |

b. Suppose we declared an array of ints:

```
int arr[] = {1, 2};
```

and we stored this in memory location 0x100 on a little endian system. What values would be stored in the following memory locations?

| 0x100 | 0x101 | 0x102 | 0x103 | 0x104 | 0x105 | 0x106 | 0x107 |
|-------|-------|-------|-------|-------|-------|-------|-------|
|       |       |       |       |       |       |       |       |

c. Suppose we declared a string:

```
char * s = "hello";
```

and we stored this in memory location 0x100 on a little endian system. What values would be stored in the following memory locations?

note: it's a good idea to get familiar with hex encodings of alphabetical characters, but for convenience, the hexadecimal encodings of the characters are: h (0x68), e (0x65), l (0x6c), and o (0x6f)

| 0x100 | 0x101 | 0x102 | 0x103 | 0x104 | 0x105 |
|-------|-------|-------|-------|-------|-------|
|       |       |       |       |       |       |