

CS 4400: Computer Systems

Problem Set 7

C function

```
int silly(int n, int *p) {
    int val, val2;

    if(n > 0)
        val2 = silly(n << 1, &val);
    else
        val = val2 = 0;

    *p = val + val2 + n;

    return val + val2;
}
```

Answer the following questions.

1. Is the variable `val` stored on the stack? If so, at what byte offset (relative to `%ebp`) is it stored, and why is it necessary to store it on the stack?
2. Is the variable `val2` stored on the stack? If so, at what byte offset (relative to `%ebp`) is it stored, and why is it necessary to store it on the stack?
3. What (if anything) is stored at `-24(%ebp)`? If something is stored there, why is it necessary to store it?
4. What (if anything) is stored at `-8(%ebp)`? If something is stored there, why is it necessary to store it?

IA32 assembly code

```
silly:
    pushl %ebp
    movl %esp,%ebp
    subl $20,%esp
    pushl %ebx
    movl 8(%ebp),%ebx
    testl %ebx,%ebx
    jle .L3
    addl $-8,%esp
    leal -4(%ebp),%eax
    pushl %eax
    leal (%ebx,%ebx),%eax
    pushl %eax
    call silly
    jmp .L4
    .p2align 4,,7
.L3:
    xorl %eax,%eax
    movl %eax,-4(%ebp)
.L4:
    movl -4(%ebp),%edx
    addl %eax,%edx
    movl 12(%ebp),%eax
    addl %edx,%ebx
    movl %ebx,(%eax)
    movl -24(%ebp),%ebx
    movl %edx,%eax
    movl %ebp,%esp
    popl %ebp
    ret
```