351 Midterm I
Winter 2012

Name: _____

Email: _____

Question1: _____ / 30

Question2: _____ / 30

Question3: _____ / 20

Question4: _____ / 20

Total: _____ / 100

Please wait until bell to start. Please return promptly at 50 minutes (or before). If you finish within the last 5 minutes, please stay until the end as a favor to your classmates.

Closed book, closed notes.

While you wait for the exam to start (or finish), I leave you this gift:

In 1202 AD, Genghis Khan defeated the Tartars. In that same year, a now rather famous individual asked the question: "How many pairs of rabbits can be produced from a single pair in a year's time?" Assume that each pair produces a new pair of offspring every month, each new pair becomes fertile at the age of one month, and the rabbits never die. So how many rabbits are there after a year?

Question 1: (30 Points). Write the assembly (64 bit x86, System V / Unix calling conventions) for the following function:

char *strchr(char *s, char c);

This function locates the first occurrence of the character specified in the argument c, in the string s. A pointer to that character is returned, or NULL if it is not found in the string. Your function short be callable from a module other than the current source file.

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Question 2: (30 points). Write the assembly function (64 bit x86, System V / Unix calling conventions) for the following C code.

```
static int fib(int x) {
    if (x <= 1)
        return x;
    return fib(x-1) + fib(-2);
}
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Question 3: (20 points)

Write the 16 bit signed binary value for 3: _____

Write the 16 bit signed binary value for 14: _____

Now, the way that computers perform the subtract operation (A - B) is to actually convert the operation to A + NEGATION_OF(B). So let's do that.

Write the 16 bit signed binary value for -14: _____

Finally, write the 16 bit signed binary value for 3 - 14:

_____

Question 4: (20 points).

4.a: Assume s is a pointer with the value 0x1000. s points to the string "Hello world!". What is the address of the letter 'w'?

Answer: _____

4.b: What is a callee saved register?

Answer: _____
_____
_____

4.c: What is the 32 bit floating point representation for -3.25? (Hint: in 32 bit FP numbers, the exponent is 8 bits).

Answer: _____

4.d: (True or False) in 64 bit x86 the first 2 integer arguments are passed in registers, the remainder on the stack.

4.e: (Big or Little) endian: the number 0xdeadbeef is stored in memory as
byte 0: 0xef, byte 1: 0xbe, byte 2: 0xad, byte 3: 0xde.

4.f (True or False) The return value from this function is always 1.

int foo() { int x = random(); int y = random(); unsigned ux = x; unsigned uy = y; return ux + uy == x + y; }

4.g: The smallest signed 16 bit integer is?

Answer: _____