Name: _____

Directions: Work only on this sheet (on both sides, if needed); do not turn in any supplementary sheets of paper. There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing. In order to get full credit, SHOW YOUR WORK.

1. Suppose a keyboard interrupt occurs during the execution of line 27 of the full example program in Section 7 of our PLN unit on subroutines. Suppose also that: c(IDT) = 50000; c(50008) = 2400; the **.data** segment starts at 1000; the **.text** segment starts at 6000.

(a) (15) The address of the keyboard ISR is _____.

(b) (15) Upon entry to the ISR, one value we can be sure is on the stack is _____. (Give a numerical answer.)

2. (20) Consider the main example (summing elements of an array) of macros in Section 10 of our PLN unit on subroutines. Let Versions O, S and M denote the original version of the code, the subroutine version, and the macro version, respectively. Then in terms of size of the executable files produced, Version M has _____ more bytes than O, and M has _____ more bytes than S. During execution Version M makes _____ more stack accesses than O, and M makes _____ more stack accesses than S. (Fill in the blanks with positive or negative integers, or 0.)

3. (25) Consider the C code

```
int sum, x[1000000];
...
for (i = 0; i < n; i++)
   sum += x[i];
```

Suppose the block size is 1024 bytes, on a 32-bit machine. What is the smallest value of **n** for which we can be sure that a **write-through** cache would do better than **write-back**?

4. (25) On p.5 of our PLN unit on the MIPS architecture, the code

```
x = 7;
addone(&x);
```

gets compiled to a total of _____ bytes of machine code.

Solutions:

1.a 2400

1.b 6000 + 0x18 = 6024

2. 0, -17, 0, -4

3. If n = 256, write-through would write the same number of bytes as write-back. With n = 257, write-through is worse.

4. The six pseudoinstructions expand to nine actual instructions. Since each of the latter is four bytes long, the total size is 36 bytes.