

Computer Project #9 -- SPARC Subprograms

Assignment Overview:

This assignment develops familiarity with subprograms in assembly language. You will develop a set of SPARC assembly language functions which implement common mathematical functions.

It is worth 40 points (4% of course grade), and must be completed no later than 11:59 PM on Thursday, April 11.

Assignment Specifications:

- 1) You will develop the SPARC assembly language functions listed below:

```
int negate( int N );
int absolute( int N );

int add( int A, int B );
int sub( int A, int B );
int mul( int A, int B );
int divide( int A, int B );
int remain( int A, int B );

int power( int N, int I );
int factorial( int N );
```

Those nine functions (and any associated "helper" functions which you develop) will constitute a module named "proj09.support.s". The functions in that module will not use any SPARC floating point instructions and they will not call any C library functions.

Function "negate" will return the negation of N.

Function "absolute" will return the absolute value of N.

Function "add" will return the sum of A and B.

Function "sub" will return the value of B subtracted from A.

Function "mul" will return the product of A and B.

Function "divide" will return the quotient of A divided by B.

Function "remain" will return the remainder of A divided by B.

Function "power" will return N raised to the Ith power.

Function "factorial" will return N!.

All functions will return the value 0x80000000 for error conditions.

- 2) You will develop a driver module in C to test your implementation of the functions in your support module. The source code for the driver must be in a separate file. All output will be appropriately labeled.

Your driver will not be interactive. If your driver accepts any input, you will supply that input in a text file named "proj09.tests".

Assignment Deliverables:

The deliverables for this assignment are:

```
proj09.makefile  -- the makefile which produces "proj09"
proj09.support.s  -- the source code for your support module
proj09.driver.c   -- the source code for your driver module
proj09.tests      -- the input to your driver, if needed
```

Be sure to submit your files for grading via the "handin" program.

Assignment Notes:

1) All function arguments are passed in the IU registers, which are managed using the "SAVE/RESTORE" convention. The calling function places the arguments in the "out" registers; after executing a "SAVE" instruction, the called function finds the arguments in the "in" registers.

2) The return value from a function is also passed in an IU register. The called function places the return value in register "%i0"; after the called function executes a "RESTORE" instruction, the calling function finds the return value in register "%o0".

3) Please note that your driver may not be written as an interactive program, where the user supplies input in response to prompts. Instead, your test cases will either be included in the source code as literal constants, or will be supplied as inputs to the driver in a file named "proj09.tests".

If your driver requires no inputs, your solution will be executed using:

```
proj09
```

If your driver does require inputs, your solution will be executed using:

```
proj09 < proj09.tests
```

4) The functions in your support module must be hand-written SPARC assembly language functions (you may not submit compiler-generated assembly language functions).