

# **16.317: Microprocessor Systems Design I**

Spring 2015

## Lecture 16: Key Questions March 6, 2015

Write a subroutine for each of the operations listed on the following pages. Note that:

- Subroutine arguments are passed on the stack, and can be accessed within the body of the subroutine starting at address EBP+8.
- At the start of each subroutine:
  - i. Save EBP on the stack
  - ii. Copy the current value of the stack pointer (ESP) to EBP
  - iii. Create space within the stack for each local variable by subtracting the appropriate value from ESP. For example, if your function uses four integer local variables, each of which contains four bytes, subtract 16 from ESP.
  - iv. Local variables can then be accessed starting at the address EBP-4.
- A subroutine's return value is typically stored in EAX.

```
int fact(int n)
```

Given a single integer argument,  $n$ , return  $n! = n \times (n - 1) \times (n - 2) \times \dots \times 1$

```
int max(int v1, int v2)
```

Given two integer arguments, return the largest of the two values.

```
void swap(int *a, int *b)
```

Given two memory addresses, *a* and *b*, swap the contents of those addresses. You may assume *a* and *b* are offsets into the data segment.