

COMS W4115 Programming Languages and Translators

Homework Assignment 3

Prof. Stephen A. Edwards

Due Tuesday, December 4th, 2018 at 11:59 PM

Submit this assignment online via Courseworks as a PDF file. Fill in or annotate this PDF or print it out, write on it, and scan it. Please keep your answer in the boxes.

Do this assignment alone. You may consult the instructor and the TAs, but not other students.

Name: Uni:

1. (20 pts.) For the following C array on a processor with the usual alignment rules,

```
int a[2][3];
```

(a) Show the order in which its elements are arranged in memory.

(b) Write an expression for the byte address of $a[i][j]$ in terms of a (the address of the start of the array), i , and j .

(c) Verify parts a) and b) by writing a small C program that **tests your hypothesis**. Examine the assembly language output with the C compiler's `-S` flag (e.g. `gcc -O -S array.c`). Such a program should be simple and contain and access such an array, but not be so simple that the compiler optimizes most of it away. On the next page, **include an annotated assembly listing** that explains how it verified your hypothesis. Make sure the assembly listing is no more than about 40 lines, either by simplifying your program or trimming the output.

C program: