

CIS 120 : PROGRAMMING LANGUAGES AND TECHNIQUES
QUIZ : October 2nd

(1) 2D Arrays

10 points

Implement matrix addition, multiplication and the transpose. You do not have to do any input checking.

Feel free to use the back

```
public class Matrix{
    public static double[][] add(double[][] a, double[][] b){
        double ret[][] = new double[a.length][a[0].length];
        for(int i = 0; i < a.length; i++){
            for(int j = 0; j < a[i].length; j++){
                ret[i][j] = a[i][j] + b[i][j];
            }
        }
    }

    public static double[][] mul(double[][] a, double[][] b){
        double ret[][] = new double[a.length][a[0].length];
        for(int i = 0; i < a.length; i++){
            for(int j = 0; j < a[i].length; j++){
                ret[i][j] = 0;
                for(int k = 0; k < a.length; k++){
                    ret[i][j] += a[k][j] * b[i][k];
                }
            }
        }
    }

    public static double[][] transpose(double[][] a){
        double ret[][] = new double[a.length][a[0].length];
        for(int i = 0; i < a.length; i++){
            for(int j = 0; j < i; j++){
                ret[j][i] = a[i][j]
            }
        }
    }
}
```

(2) Pointers

5 points

Given the following class definition:

```
public class A{
    A[] arr = new A[1];
    public static void m(A a){
        arr[0] = a;
    }
}
```

Draw the stack and the heap after the following code is executed:

```
> A a = new A();
> a.m(a);
> a == a.arr[0]
```

And what is printed?