MACS 261J
2nd Midterm Exam
April 16, 2010   Name: _____

Question:	1	2	3	4	5	6	7	Total
Points:	5	4	7	8	4	12	10	50
Score:								

Question 1 . . . . (5 points)

Write a program fragment to construct a new array of 100 `double`s and initialize them (in a `for` loop) to the values $0.01, 0.02, 0.03, \ldots, 1.00$.

Question 2 . . . . (4 points)

What is printed by the following program fragment:

```
int[] a = {4, 3, 2, 1};
int[] b = a;
System.out.println("a="+a[2]+","+a[3]);
System.out.println("b="+b[2]+","+b[3]);
b[2] = 2;
a[2] = 0;
System.out.println("a="+a[1]+","+a[2]);
System.out.println("b="+b[1]+","+b[2]);
```

Question 3 . . . . (7 points)

Complete the method below that determines whether two arrays are different. (Two arrays `a` and `b` differ if they have different lengths or if, for any index `i`, `a[i]` does not equal `b[i]`.)

```
public static boolean differ(float[] a, float[] b) {




}
```

Question 4 .... (8 points)

Complete the following method:

```java
/**
 * Returns a centered subset of the specified input image.
 * The center pixel in the subset is the same as that in the input.
 * The subset has half the width and half the height of the input.
 * @param x input image.
 * @return output image, a new array (not the array x).
 */
public static float[][] subset(float[][] x) {



}
```

Question 5 .... (4 points)

Java has many standard classes of errors and exceptions.

(a) [2 points] What do the classes `Error` and `Exception` have in common?

(b) [2 points] Give an example of a class that extends `Error`.

Give an example of a class that extends `Exception`.

Question 6 . . . . (12 points)

(a) [3 points] Write code defining an interface `Shape` with one method `contains` that, given a `float x` and a `float y`, returns `true`, if the point `(x,y)` lies inside the `Shape`, or `false`, otherwise.

(b) [6 points] Write code that defines a class `Circle` that correctly implements the interface `Shape`. The class `Circle` has a constructor with three parameters: the center coordinates `x` and `y`, and the radius `r`, with corresponding private fields.

(c) [3 points] Write code that constructs a `Circle` object and then uses that object to determine and print whether or not the point `(5,3)` lies inside.

Question 7 . . . . (10 points)
Both *text* and *binary* formats are used to store scientific data in files.

(a) [2 points] Text files are slow to read and write. Why are they used for scientific data?

(b) [2 points] For binary files, why should you use `DataOutputStream` instead of `ObjectOutputStream` (which our text recommends!)?

(c) [2 points] How many bytes are in a binary file with exactly one `int` and ten `float`s?

(d) [4 points] What standard Java classes would you use to read one `int` and one `double` from a binary file named `junk.dat`? Include in your answer any `Exception`s you must catch.