MACS 261J
2nd Midterm Exam
April 10, 2009 **Name:** _____

Question:	1	2	3	4	5	6	7	Total
Points:	4	4	7	8	4	13	10	50
Score:								

Question 1 ..... (4 points)

What is printed by the following program fragment:

```
int[] a = {85, 95, 73, 29};
System.out.println("a="+a[1]+","+a[2]);  a=95,73
int[] b = a;
b[2] = 31;
System.out.println("a="+a[1]+","+a[2]);  a=95,31
System.out.println("b="+b[1]+","+b[2]);  b=95,31
```

Question 2 ..... (4 points)

Write code to (1) construct a new array of 1000 `int`s and (2) set all of them to the value `3`.

```
int[] a = new int[1000];
for (int i=0; i<1000; ++i)
  a[i] = 3;
```

Question 3 ..... (7 points)

Complete the method below that determines whether two arrays are equal. (Two arrays are equal if they have the same length and the same values.)

```
public static boolean equal(float[] a, float[] b) {
  if (a.length!=b.length)
    return false;
  for (int i=0; i<a.length; ++i) {
    if (a[i]!=b[i])
      return false;
  }
  return true;
}
```

Question 4 ..... (8 points)

Complete the following method:

```
/**
 * Returns a negative of the specified image. Image values are in [0,255].
 * The input value 0 becomes 255 in the negative, the value 255 becomes 0,
 * and other values between 0 and 255 are transformed in a similar way.
 * @param x input image; every image row has the same number of pixels.
 * @return output image, the negative of x.
 */
public static float[][] negative(float[][] x) {









}
```

Question 5 ..... (4 points)

Java has many standard classes of errors and exceptions.

(a) [2 points] What is special about the standard class `RuntimeException`?

(b) [2 points] Why must you catch a `FileNotFoundException` *before* (instead of after) catching an `IOException`?

Question 6 . . . . . (13 points)

(a) [3 points] Write code that defines an interface `Function` with one method that, given a `float x`, returns a corresponding `float`. This interface represents a generic mathematical function $y(x)$ of one variable x.

(b) [7 points] Write code that defines a class `Quadratic` that implements the interface `Function`. The class `Quadratic` represents the mathematical function $y(x) = ax^2 + bx + c$, so it has a constructor with three parameters and private fields for the coefficients a, b, and c.

(c) [3 points] Write code that constructs a `Quadratic` object for the function $y(x) = x^2 + x + 2$, and then uses that object to compute the value of $y(3)$.

Question 7 . . . . . (10 points)

Both *text* and *binary* formats are used to store scientific data in files.

(a) [2 points] Text files are easy to read. Why not simply use text files for all 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 three `float`s?

(d) [4 points] Write code that prints the string `pi=3.14` to a file `junk.txt`. (Remember to close any files you open.)