MACS 261J
Final Exam
May 5, 2008 **Name:** ____________________

Question:	1	2	3	4	5	6	7	8	9	Total
Points:	15	10	15	5	10	5	20	8	12	100
Score:										

Question 1 . . . . (15 points)

(a) [5 points] Write a complete Java program that computes and prints the area of a circle with radius 5.

(b) [5 points] Show how you would modify the program above to prompt the user for a radius on the command line, and then compute and print the area of a circle for that radius. Do not rewrite the entire program. Just indicate which line(s) you would replace, and what you would replace them with.

(c) [5 points] Show how you would modify the program above to exit gracefully in the exceptional cases where (a) the user enters something that is not a number or (b) enters a negative radius. Again, do not rewrite the entire program.

Question 2 . . . . (10 points)

Consider the method foo defined by:

```
public static void foo(double[] a) {
  double b = 0.0;
  for (int i=0; i<a.length; ++i) {
    if (b<a[i])
      b = a[i];
  }
  return b;
}
```

(a) [2 points] This code will not compile without error. Fix it.

(b) [3 points] What does the following program fragment print?

```
double[] a1 = { 1.0, 3.0, 2.0};
double[] a2 = { 1.0, 0.0,-1.0};
double[] a3 = {-1.0,-3.0,-2.0};
System.out.println(foo(a1));
System.out.println(foo(a2));
System.out.println(foo(a3));
```

(c) [3 points] Rename the method foo to better describe what it is supposed to do.

(d) [2 points] The three tests cases printed above reveal a likely bug. (It's a common error.) Modify the method so that it does what is likely intended.

Question 3 . . . . (15 points)

(a) [10 points] Implement the following method as specified:

```
/**
 * while n is greater than 1 {
 *   prints the value of n followed by a blank space
 *   if n is even,
 *     replaces n with n/2
 *   otherwise if n is odd,
 *     replaces n with 3*n+1
 * }
 * prints the value of n followed by a newline
 */
public static void goofy(int n) {









}
```

(b) [5 points] Assuming that you have implemented this method as specified, what sequence of numbers is printed by the following program fragment?

```
for (int i=1; i<=4; ++i)
  goofy(i);
```

Question 4 . . . . (5 points)

(a) [2 points] Given two Java `floats` `x` and `y`, how would you determine if they are equal?

(b) [3 points] Given two Java `Strings` `s` and `t`, how would you determine if they are equal?

Question 5 . . . . (10 points)

Complete the following methods:

(a) [5 points]

```
/**
 * Returns a new array that contains the elements in two arrays.
 * Specifically, for a specified array x with m floats and array
 * y with n floats, this method returns an array with m+n floats,
 * with the elements in x followed by those in y.
 */
public static float[] combine(float[] x, float[] y) {









}
```

(b) [5 points]

```
/**
 * Returns the number of floats in an array of array of floats.
 * (Assumes that the lengths of the arrays of floats may vary.)
 */
public static int count(float[][] x) {






}
```

Question 6 . . . . (5 points)

(a) [1 point] How many *bits* in a Java `byte`?

(b) [1 point] How many bytes in a Java `int`?

(c) [1 point] How many bytes in a Java `short`?

(d) [1 point] How many bytes in a Java `float`?

(e) [1 point] How many bytes in a Java `double`?

Question 7 . . . . (20 points)

Complete the class `Point` by filling in the blanks below.

```
public class Point {
  /**
   * Constructs a point with specified (x,y) coordinates.
   * @param x the x coordinate.
   * @param y the y coordinate.
   */
  public Point(double x, double y) {



  }
  /**
   * Moves this point by the specified amounts.
   * @param dx amount to add to the x coordinate of this point.
   * @param dy amount to add to the y coordinate of this point.
   */
  public void move(double dx, double dy) {



  }
  /**
   * Returns the distance between this point and another point.
   * @param p the other point.
   * @return the distance.
   */
  public double distanceTo(Point p) {




  }
  /**
   * Returns a new point with the same coordinates as this point.
   * @return the new point.
   */
  public Point clone() {


  }


}
```

Question 8 . . . . (8 points)

Using every method in the class `Point` defined above, ...

(a) [2 points] Construct a `Point p` with coordinates $(2, 1)$.

(b) [2 points] Get a copy `Point q` of the `Point p`.

(c) [2 points] Move `q` a distance of `3` in any direction.

(d) [2 points] Print the distance between `p` and `q`.

Question 9 . . . . (12 points)

Consider a binary file with exactly 100,000 floats that represent an image.

(a) [2 points] Why would we typically not store this image as a text file?

(b) [2 points] Augment the javadoc comments and declaration of the method `readImage` below to include any extra information you would need to extract the image from the file.

(c) [8 points] Complete the method `readImage` as specified.

```
/**
 * Returns the image stored in the specified file.
 * @param fileName name of the file containing the image.
 *
 *
 * @return array of arrays of floats containing the image.
 */
static float[][] readImage(String fileName,                   ) {









}
```