

**MACS 261J**  
**1st Midterm Exam**  
**February 19, 2010**

**Name:** \_\_\_\_\_

Question:	1	2	3	4	5	Total
Points:	5	10	10	10	15	50
Score:						

Question 1 ..... (5 points)

In the Java statement

```
public static final double PI = 3.14159;
```

what is the meaning of

- the keyword `static`?
- the keyword `final`?

Write a Java statement that computes and prints  $\sin(\pi/5)$ .

Find the syntax error in the following alternative declaration:

```
public static final float PI = 3.14159;
```

Question 2 ..... (10 points)

What is printed by the following Java statements?

```
int x = 3 * 5 - 3 / 3;  
int y = x/4;  
int z = x%4;  
System.out.println("x="+x+" y="+y+" z="+z);  
x = 9; y = 9; z = 9;  
++x; --y; z *= 2;  
System.out.println("x="+x+" y="+y+" z="+z);
```

Question 3..... (10 points)

What is printed by these Java statements?

```
for (int i=0; i<3; ++i)
    System.out.print(i); // not println!

for (int i=3; i>0; --i)
    System.out.print(i); // not println!

int n = 3;
while (n!=1) {
    if (n%2==0) {
        n = n/2;
    } else {
        n = 3*n+1;
    }
    System.out.println(n);
}
```

Question 4..... (10 points)

Use the method `fillOval(x,y,width,height)` in the standard class `java.awt.Graphics` to complete the following method.

```
/**
 * Draws a circular disk centered within a rectangle with specified width
 * and height. The disk's diameter is the smaller of the specified width
 * and height. The disk's center is the center of the rectangle.
 * Coordinates of the upper-left corner of the rectangle are (0,0).
 * @param g the graphics context.
 * @param w the rectangle width, in pixels.
 * @param h the rectangle height, in pixels.
 */
public static void drawDisk(Graphics g, int w, int h) {
```

```
}
```

Question 5 ..... (15 points)

(a) [10 points] Implement all methods for the following class:

```
/**
 * A linear function  $y(x) = a*x + b$ . This function has a root (a value
 *  $x$  such that  $y(x) = 0$ ) if and only if the coefficient  $a$  is non-zero.
 */
public class LinearFunction {

    /** Constructs a linear function with specified coefficients. */
    public Linearfunction(double a, double b) {

    }

    /** Returns the function value  $y(x)$ . */
    public double y(double x) {
                                                // one statement only!
    }

    /** Returns true if the function has a root. */
    public boolean hasRoot() {
                                                // one statement only!
    }

    /** Gets the root for this linear function. */
    public double getRoot() {
                                                // one statement only!
    }

    /**
     * Determines whether this linear function equals the specified one.
     * Two linear functions are equal if they have the same coefficients.
     */
    public boolean equals(LinearFunction lf) {
                                                // one statement only!
    }

    // declare private
    // fields here
}
```

- (b) [5 points] The first part (a) of this question (on the previous page) was about *implementing* a class. This part is about *using* that class. Specifically, *using the methods of the class LinearFunction specified above*, implement the method main for the following class:

```
/**
 * Demonstrates use of the class LinearFunction.
 * (1) Constructs a linear function  $y(x) = 3x+2$ .
 * (2) Uses the constructed function to print its root.
 * (3) Constructs another linear function.
 * (4) Compares the two linear functions and
 *     prints whether they are equal.
 */
public class LinearFunctionDemo {
    public static void main(String[] args) {

        }
    }
}
```