Question 1. ........................................................................................................ (5 points)
In the Java statement

```java
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:

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

Question 2. ........................................................................................................ (10 points)
What is printed by the following Java statements?

```java
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. What is printed by these Java statements?

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

```java
/**
 * 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:

```java
/**
 * 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:

```java
/**
 * 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) {
```