

Name and, if possible, ID#:

AMERICAN UNIVERSITY OF ARMENIA
College of Science and Engineering
COMP120 Introduction to Object-Oriented Programming

FINAL EXAM

4/15

Date: Monday, May 18 2015
Starting time: 09:20
Duration: 1 hour 40 minutes
Attention: ANY TYPE OF COMMUNICATION IS PROHIBITED
Please write down your name at the top of all used pages

Problem 1

Consider below a *public interface Valuable* that includes the only method *public double value(double x)*:

```
public interface Valuable {  
    public double value(double x);  
}
```

1.1 Implement a *public class Function* that encapsulates a member variable of type *Valuable* and computes its max in the specified range from x_1 to x_2 by looking at:

$f(x_1), f(x_1+dx), f(x_1+2dx), \dots, f(x_1+k*dx)$, where $k = 1, 2, \dots$ and $x_1+k*dx < x_2$

```
public class Function {  
    private Valuable f;  
    private double dx;  
  
    public Function(Valuable newValuable, double newDX) {  
        //TO BE IMPLEMENTED  
        f = new Valuable (newValuable);  
        dx = new DX;  
    }  
  
    public double max(double x1, double x2) {  
        //TO BE IMPLEMENTED  
        for (int i = 0; i < function(x1 + i * dx) < function(x2, i * dx); i++)  
            return i; }  
}
```

1.2 Implement an expression

$$a * \sin(x) + b * \cos(x)$$

as a *public class Harmonic* that implements the interface *Valuable* and encapsulates double parameters *a* and *b*. The parameters are initialized by the two-argument constructor *public Harmonic(double newA, double newB)*;

1.3 In a separate *public static void main(String args[])* write a code that inputs two double values, creates an object of type *Harmonic* and, using the class *Function*, prints its maximal value in the range from $x_1 = -1.5$ to $x_1 = 1.5$:

```
public static void main(String args[]) {  
    Scanner input = new Scanner(System.in);  
    double a = input.nextDouble(), b = input.nextDouble();  
  
    //TO BE COMPLETED  
}  
}
```

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```
private double a, b;  
public Harmonic (double newA, double newB)  
{  
    a = newA;  
    b = newB;  
}  
public double value (double x)  
{  
    return (a * Harmonic(x) + b * Harmonic(x));  
}  
}
```


