浙大宁波理工国际班2022年 Java 编程

Assignment 1 (due to 5pm, Thursday , March 31)

Assignment instructions.

Only use the Java described up to week 4. Solve all stated problems, explaining any additional assumption you make. You can use any editor to edit your Java classes. However your Java classes must successfully compile and run. For this reason the use of powerful IDE's like NetBeans is discouraged. Simpler editors like Notepad++ or EditPlus are more than adequate.

Submission Instructions:

Your submission, for each problem set, should consist of a single Java class (submitted as a text file with extension ".java"). Submissions involving two or more classes will be penalised. Do not submit any separate documentation file (you can have comments at the top of your java files to describe what you've done and possible test cases you've checked your program against). Compress your programs into a single file with your student ID as the file name and then submit.

Marking criteria :

Marking criteria is based on the task decompositions. Zero mark will be given to the programs that can not be compiled. Pagiarized program will cause FAILED result.

Format your program properly and always give sufficient comments. Otherwise certain points will be deducted.

Question 1.
(a) You put $1000 in the bank at 5% annual interest. Calculates how long it will take to become a millionaire

Usually banks pay interest daily or monthly, but for simplicity let us stick with interest paid once at the end of each year. At the end of the second year you will have $1050 + $1050*0.05 = $1102.50. Here is what your account looks like at the end of the first several years:

year	Interest for the Year	End of Year Amount
1	1000*0.05=50	1050.00
2	1050*0.05=52.5	1102.50
3	1102.50*0.05=55.125	1157.625
4	1157.625*0.05=57.88125	1215.50625
5	1215.50625*0.05=60.77531	1276.28156

(b) Suppose you put an extra $1000 into your bank account at the end of every year. Now how long will it take to reach your million dollar goal?

(c) We need to find a bank with an interest rate higher than five percent. Say that you are willing to wait 40 years for your million dollars. How high must the interest rate be?
Hint: One way to answer this question is to try out various interest rates until you find one that works. In Java, you can implement such a trial by:

```
// get the interest rate from the user
Scanner scan = new Scanner( System.in );
System.out.print("Enter the interest rate in percent: ");
rate = scan.nextDouble()/100.0 ;
```

Note: (a), (b) and (c) should be implemented in separate programs and all of the programs are required to apply appropriate looping.

[**20 points]**

Question 2
The Bisection method is a simple example of numerical algorithms for solving equations. The algorithm uses the classic divide and conquer strategy. Begin with an interval that contains the unknown solution. Divide it in half, discard the half that does not contain the solution, and repeat.

Write a program that implements the Bisection Algorithm to solve the equation
$\sqrt{x} = \cos x$,
which has the same solution as the equation
$\sqrt{x} - \cos x = 0$.

Its solutions are the x-intercepts of the graph of the equation $y = \sqrt{x} - \cos x$

We know that there must be a solution within the interval from 0 to π/2 because at x=0, $y = \sqrt{0} - \cos 0 = 0 - 1 = -1 < 0$, and at x=π/2, $y = \sqrt{\pi/2} - \cos \pi/2 = \sqrt{\pi/2} - 0 > 0$. A continuous curve cannot be below the x-axis at one point and above it at another without crossing it in between.

Hint: define a precision value, e.g., `TOL = 0.5E-7`

[**20 points]**

Question 3.

Implement Newton-Raphson Method for solving nonlinear equation

$y=\cos x+x^3$

Newton-Raphson Method :

Consider a curve y = f(x), Let (x_0, f(x_n)) be any point on curve where x_0 is initial root. Now the curve is approximated by the tangent at the point (x_0, f(x_n)). This tangent if meets X-axis at x = x_1 then the new approximation is x_1 as the root. In this method, we follow the steps:

a) Find points a and b such that a < b and f(a)·f(b) < 0.

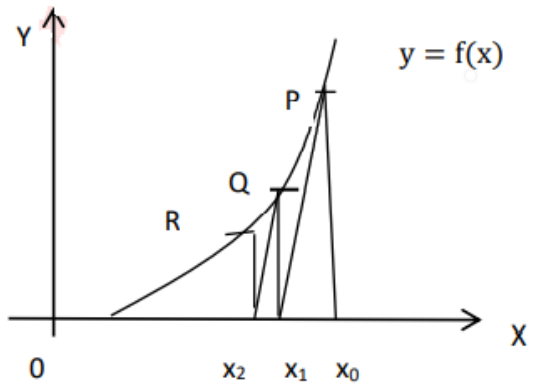
b) Take the initial value x_0 value in the interval [a, b]

c) Find f(x_n) and f'(x_n)

$x_{n+1} = x_n -$ f(x_n) /f'(x_n)

d) If f(x_n) = 0 then x_n is an exact root, else $x_0 = x_n$

e) Repeat steps (c) and (d) until f(x_n) = 0 or |f(x_n)| ≤ desired accuracy



[**30 points]**

Question 4.

The following two questions are about the simulation of rolling a pair of dice.

(a) Write a program to compute and print the number of rolls it takes to get snake eyes. (Snake eyes means that the total showing on the dice is 2.)

(b) Write a program that simulates rolling a pair of dice until the total on the dice comes up to be a given number (one of the possible totals: 2, 3, ..., 12) . The number that you are rolling for is entered from the keyboard. The number of times you have to roll the dice is printed out.

[**30 points]**