EP 208 Computational Method in Physics, Final Exam Questions

These are the final exam questions (starting from next page) of the course.
Here is the instructions for sending your solutions after downloading this file.

S1. Print this document
S2. Write your solution steps clearly in the space
    provided.
S3. Scan your solution papers and save as pdf file
    named ep208-fin-yourIdNo.pdf
    such as ep208-fin-12345691.pdf
S4. Send the file to Email Address bingul@gantep.edu.tr
S5. Subject (konu) of your email must be
    ep208 fin yourIdNo

Deadline date / time : 18 June 2023 / 13:00

If you do not obey one of the rules above, your paper won't be considered as an exam paper!

Good Luck,
Prof. Dr. Ahmet Bingül

Fill in the blanks below:

Name :
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(25 %) Evaluate the following integral:

(a) by using analytical method $\int_{-2}^{2} \frac{\sin(x)}{x} dx$

(b) Use int() function MATLAB to compare your results.

(c) Write a C++ or MATLAB program by using Simpson's Method with n = 1000 parts.

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(25 %) Find the root of the equation $\cos(2x) = x^2$

(a) by using `fzero()` function in MATLAB

(b) by using Newton-Raphson Method with tolerance = 0.01. Do not write computer program. Solution has to be performed manually.

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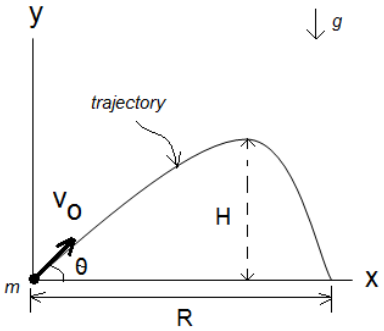
(25 %) 3. A ball of mass m = 0.6 kg and radius r = 0.1 m is fired up with an angle of $\theta = 32^o$ and with an initial speed of v_0 = 50 m/s. Assume that the drag coefficient is given by C_d = 0.2, and air density is ρ = 1.2 kg/m^3 and g = 9.8 m/s^2.



(a) Write down the equations of motion both in x and y directions and Cromer-Euler steps for the numerical solution.

(b) Write a C++ or MATLAB program to estimate its maximum height (H) and maximum range (R) of the ball for $h = \Delta t$ = 0.01 s. Write down program's output.

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(25 %) 4. Time (*t*) vs velocity (v) data of a drone moving upward direction is collected as follows:

```
t(s)   | 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6
-------+--------------------------------
v(m/s)| 3.1 4.0 5.1 6.0 6.9 8.1 9.0 9.8
```

Write C++ or MATLAB program to determine the initial of speed of the drone at $t = 0$ using Linear Least Square Fitting Method. Do not use `cftool`. Write down the output of your program.