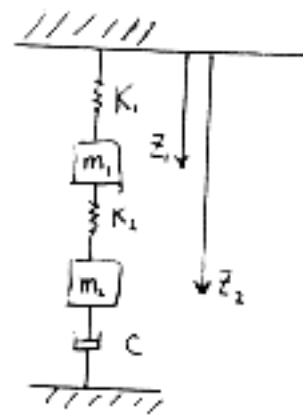


1.) (17分) Solve $y'' + 4y' + 13y = \frac{1}{3} e^{-2t} \sin 3t$

- 2.) (17分) a) Derive two D.E.'s to represent the following mechanical systems. (10分)
- b) Write the 4-th order equation, which describes this system with eliminating the variable z_2 . (7分)

<Note: D.E.'s are Differential Equations>



let z_1^0 = no forces extended by spring K_1
 z_2^0 = no forces extended by spring K_2

- 3.) (16分) Find a general solution for

$$x^2 y' = y^2 + 2xy$$

4. Find the area of the following surface

$$z = x^2 + y^2, \quad 0 \leq z \leq 10$$

(17分)

5. Find the Fourier series of the following function which is assumed to have the period 2π

$$f(x) = \begin{cases} x^2/2 & \text{if } -\pi/2 < x < \pi/2 \\ \pi^2/8 & \text{if } \pi/2 < x < 3\pi/2 \end{cases}$$

(17分)

6. Use Newton's method to find a solution to $x - \cos x = 0$, accurate to within 10^{-4} , on the interval $[0, \pi/2]$.

(16分)