

系所:機械系

科目:工程數學(1)

1. (25%) Please find the general solution of the following ordinary differential equation (O.D.E.):

$$y' = \frac{y + x}{x}$$

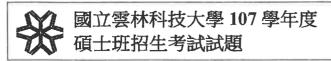
2. Consider the 2<sup>nd</sup> order O.D.E.

$$y'' + 2y' + y = f(t),$$
  $y(0) = y'(0) = 0$ 

y is a function of t. Please find the initial value problems for all  $t \ge 0$  according to each f(t) as follows.

(a) 
$$f(t) = 1$$
 for all  $t \ge 0$  (10%)

(b) 
$$f(t) = \begin{cases} 1 & 0 \le t \le 1 \\ 0 & otherwise \end{cases}$$
 (15%)



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Prob. 3 (10%)

Find the directional derivative of 
$$f(x,y,z) = \sin(x - y + 2z)$$
 at (3.2, -1.1, -3.0) in the direction of  $-\vec{i} + \vec{j} + \vec{k}$ 

Prob. 4 (15%)

Find an equation of the tangent plane to the surface of 
$$2x - \cos(xyz) = 3$$
 at  $(1, \pi, 1)$ .

Prob. 5 (25%)

Calculate the work done by the force  $\vec{F}(t) = \vec{i} - x \vec{j} + \vec{k}$  in moving a particle from (1,0,1) to  $(-1,0,\pi)$  along the curve  $x = \cos(t)$ ,  $y = \sin(t)$ , z = t.