

(1) If $F(s)$ is the Laplace transform of $f(t)$ and $F(s) = \frac{s+1}{s^2+s-6}$. Find $f(t)$. (25%)

(2) The gradient of a scalar function f is defined as

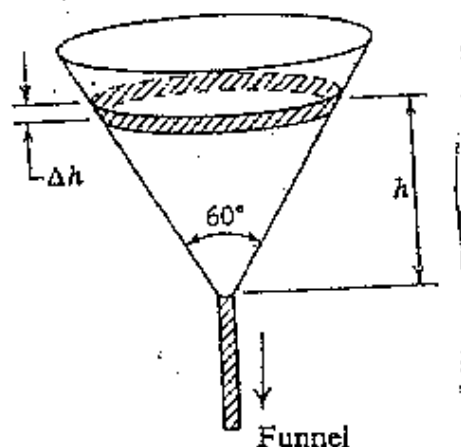
$$\nabla f = \frac{\partial f}{\partial x} \mathbf{i} + \frac{\partial f}{\partial y} \mathbf{j} + \frac{\partial f}{\partial z} \mathbf{k}$$

The divergence of a differentiable vector function \mathbf{V} is defined as

$$\text{div } \mathbf{V} = \frac{\partial v_1}{\partial x} + \frac{\partial v_2}{\partial y} + \frac{\partial v_3}{\partial z}$$

where v_1, v_2 and v_3 are components of \mathbf{V} . Express $\text{div}(f\mathbf{V})$ as a function of f, \mathbf{V} , $\text{div}\mathbf{V}$ and ∇f . (25%)

(3) A funnel, as shown in the figure, whose angle at the outlet is 60° and whose outlet has a cross-sectional area of 0.5 cm^2 , contains water. At time $t=0$ the outlet is opened and the water flows out. Determine the time when the funnel will be empty, assuming that the initial height of water is $h(0)=10 \text{ cm}$. The velocity with which a liquid issues from an orifice is $v=0.6(2gh)^{1/2}$. (25%)



(4) (25%)

- 請畫一流程圖及寫一程式(可用 C 或 Fortran 或 Basic 語言)以找出由鍵盤輸入的十個實數中的最大值及第二大的值，並將此二數值顯示於螢幕上。
- 若此十個實數乃存於一置於 C 碟的文字檔(c:\data.txt)中，而非由鍵盤輸入，則上題的程式要如何修正？

(你可在上題的程式中標示行號，再說明第幾行如何修改)

data.txt 範例：

10.1 8. 9. 3. 4.5 6.23 8.7 2.1 0.3 12.2