

國立臺灣科技大學

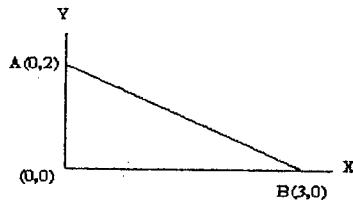
九十二學年度博士班招生考試試題

系所組別：機械工程系博士班甲一組、甲二組、乙組、丙組、丁組、戊組
 科目：工程數學

Total 100%, each problem is worth 20%.

1. From point A to point B is a straight line. There is a function w as: $w = x^2 + xy - y^2$.

Evaluate the line integral: $\int_A^B \frac{\partial w}{\partial n} ds$ along the line AB.

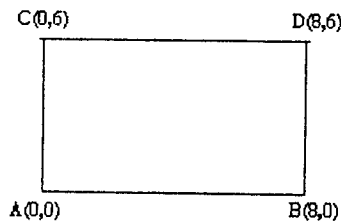


2. Solve the general solution of the following differential equation.

$$1 + xy + 3xy^2y' + x^2y' = 0$$

3. Find unit normal vector of the surface $z^2 = x^2 + y^2$ at point $(3,4,5)$.

4. A rectangular plate is shown in the figure below.



The temperature on the boundaries are insulated as followings:

Along AB: $u(x,y) = 0$, along AC: $u(x,y) = 0$,

Along CD: $u(x,y) = 100 \sin \frac{\pi x}{16}$, along BD: $u(x,y) = 100 \sin \frac{\pi y}{12}$.

The temperature function is given as $\frac{\partial u}{\partial t} = 4\nabla^2 u$. Determine the steady state solution for the temperature distribution on the plate.

5. Consider a complex number $z = x + iy$, proof the real and imaginary parts of a function $\cos z$ can be written as :

Re $\cos z = \cos x \cosh y$; and Im $\cos z = -\sin x \sinh y$.

