Please answer each of the following questions showing all of your work and discussing your reasoning so that I can follow what you've done and give partial credit.

1. Find the derivative of $z = f(x,y)$ where $z = \sin x + \ln(xy) + y^4$ (10%)

2. Find the integration of $\int \frac{x^2 dx}{ax+b}$, where a and b are constant variables. (10%)

3. (a) Calculate the dot product of the following two vectors and determine whether or not the two vectors are orthogonal:

   $A = 8i - 3j + 2k,$
   $B = -8i - 3j + k$ (10%)

   (b) Calculate the cross product of the following two vectors ($A \times B$):

   $A = 2i - 3j + 4k$
   $B = -3i + 2j$ (10%)

4. Find the general solution of the following ordinary differential equations:

   (a) $y' + xy = xy^2$ (10%)

   (b) $y' - 2y = -8x^2$ (10%)

5. Find the general solution of the following differential equation for positive and negative value of $n$.

$$\frac{d^2z}{dt^2} = -n^2 z \quad (10\%)$$

6. Find the (a) determinant, (b) eigenvalues and (c) the corresponding eigenvectors of the matrix $\begin{pmatrix} 3 & 0 & 0 \\ 1 & -2 & -8 \\ 0 & -5 & 1 \end{pmatrix}$ (30%)

試題隨卷繳回