Experiments show that in a temperature field $T = x^3 - 3xy^2$, heat flows in the direction of maximum decrease of temperature *T*. Find this direction in general and at a given point P($\sqrt{8}, \sqrt{2}$). [98 中山機電 I 2]

[解]方向為

$$\nabla T = \frac{\partial T}{\partial x}\mathbf{i} + \frac{\partial T}{\partial y}\mathbf{j} = (3x^2 - 3y^2)\mathbf{i} - 6xy\mathbf{j}$$

在點P($\sqrt{8}, \sqrt{2}$)的方向為

$$(3\cdot 8 - 3\cdot 2)\mathbf{i} - 6\cdot\sqrt{8}\cdot\sqrt{2}\mathbf{j} = 18\mathbf{i} - 24\mathbf{j}$$