

1. (10.3)

$$F = \frac{x}{\sqrt{x^2+y^2}} i + \frac{y}{\sqrt{x^2+y^2}} j + 0 k$$

$$G = \frac{-y}{x^2+y^2} i + \frac{x}{x^2+y^2} j + 0 k$$

$$a \quad M_1 = \frac{x}{\sqrt{x^2+y^2}}, \quad N_1 = \frac{y}{\sqrt{x^2+y^2}}, \quad P_1 = 0$$

$$\frac{\partial P_1}{\partial y} = 0 = \frac{\partial N_1}{\partial z}, \quad \frac{\partial P_1}{\partial x} = 0 = \frac{\partial M_1}{\partial z}, \quad \frac{\partial M_1}{\partial y} = -\frac{xy}{(x^2+y^2)^{\frac{3}{2}}} = \frac{\partial N_1}{\partial x}$$

$\Rightarrow F$ satisfies the component test

$$M_2 = \frac{-y}{x^2+y^2}, \quad N_2 = \frac{x}{x^2+y^2}, \quad P_2 = 0$$

$$\frac{\partial P_2}{\partial y} = 0 = \frac{\partial N_2}{\partial z}, \quad \frac{\partial P_2}{\partial x} = 0 = \frac{\partial M_2}{\partial z}, \quad \frac{\partial M_2}{\partial y} = \frac{y^2-x^2}{(x^2+y^2)^2} = \frac{\partial N_2}{\partial x}$$

$\Rightarrow G$ satisfies the component test