(3) $F = (P, Q) = (x - 2y,\ 2x - y)$

(a)

$$\operatorname{div} F = \frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y} = 1 - 1 = \boxed{0}$$

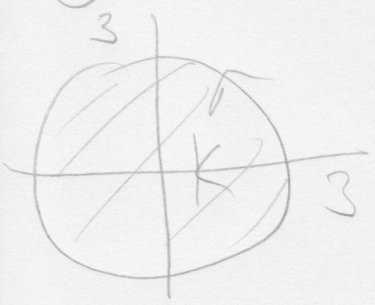
$$\operatorname{rot} F \cdot \underline{k} = \frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} = 2 - (-2) = \boxed{4}$$

$$G = (\hat{P}, \hat{Q}) = (y - 2x,\ x - 2y)$$

$$\operatorname{div} G = \frac{\partial \hat{P}}{\partial x} + \frac{\partial \hat{Q}}{\partial y} = -2 - 2 = \boxed{-4}$$

$$\operatorname{rot} G \cdot \underline{k} = \frac{\partial \hat{Q}}{\partial x} - \frac{\partial \hat{P}}{\partial y} = 1 - 1 = 0$$

(b) $\gamma(t) = 3(\cos t, \operatorname{sen} t)$



Green $\Rightarrow \displaystyle\int_{\gamma} F \cdot d\gamma = \iint_{K} \operatorname{rot} F \cdot \underline{k}\, dx\, dy$

$$= 4 \iint_{K} dx\, dy = 4 \cdot \text{área}(|c|) = 4 \cdot \pi r^2$$

$$= 4 \cdot 9\pi = \boxed{36\pi}$$

$$\int_{\gamma} G \cdot d\gamma = \iint_{K} \operatorname{rot} G \cdot k\, dx\, dy = \boxed{0}$$