1.

Consider Forkker Panck equation $\underline{\frac{\partial}{\partial t}p(x,t) = -\frac{\partial}{\partial x}(fp) + \frac{1}{2}\frac{\partial^2}{\partial x^2}(g^2 p)}$ ①

and $dx_t = v(x_t,t)\,dt$ satisfy $\underline{\frac{\partial}{\partial t}p(x,t) = -\frac{\partial}{\partial x}(vp)}$ ②

② 代入 ①

$$\Rightarrow -\frac{\partial}{\partial x}(vp) = -\frac{\partial}{\partial x}(fp) + \frac{1}{2}\frac{\partial^2}{\partial x^2}(g^2 p)$$

$$\Rightarrow \frac{\partial}{\partial x}(vp) = \frac{\partial}{\partial x}\left(fp - \frac{1}{2}\frac{\partial}{\partial x}(g^2 p)\right)$$

$$\Rightarrow vp = fp - \frac{1}{2}\frac{\partial}{\partial x}(g^2 p)$$

$$\Rightarrow v\cancel{p} = f\cancel{p} - \frac{1}{2}\left[\frac{\partial}{\partial x}(g^2)\cdot\cancel{p} + \underset{p}{\underline{g^2\cdot\frac{\partial}{\partial x}(p)}}\right]$$

$$\Rightarrow v = f - \frac{1}{2}\left[\frac{\partial}{\partial x}(g^2) + g^2\cdot\frac{1}{p}\cdot\frac{\partial}{\partial x}p\right]$$

$$\Rightarrow v = f - \frac{1}{2}\left[\frac{\partial}{\partial x}(g^2) + g^2\cdot\frac{\partial}{\partial x}(\ln p)\right]$$

$$\therefore dx_t = v\,dt$$

$$= \left[f - \frac{1}{2}\frac{\partial}{\partial x}g^2 - \frac{g^2}{2}\frac{\partial}{\partial x}(\ln p)\right]dt \quad \#$$