~~1 martingale f each n.~~

1. Insert the soln into PDE,

$$LHS = \frac{1}{2}\cdot 4 - (x_1-\tfrac{1}{2})^2 - (x_2-\tfrac{1}{2})^2 + x_1^2 + x_2^2 - x_1 - x_2 - \tfrac{3}{2}$$
$$= 0 = RHS. \quad \checkmark$$

2. $\partial_i v(x) = \dfrac{v(x+he_i) - v(x-he_i)}{2h}$.

$$\partial_{ii} v(x) = \frac{v(x+he_i) + v(x-he_i) - 2v(x)}{h^2}$$

Let $v_i^+ = v(x+he_i)$

$v_i^- = v(x-he_i)$.

$$\Rightarrow \frac{1}{2}\cdot\sum_{i=1}^{2} \frac{v_i^+ + v_i^- - 2v(x)}{h^2} - v(x) + x_1^2 + x_2^2 - x_1 - x_2 - \frac{3}{2} = 0$$

$$\frac{2+h^2}{2} v(x) = \sum_{i=1}^{2} v_i^+ \cdot \frac{1}{4} + \sum_{i=1}^{2} v_i^- \cdot \frac{1}{4} + \frac{h^2}{2}(x_1^2 + x_2^2 - x_1 - x_2 - \tfrac{3}{2})$$

$$v(x) = \frac{2}{h^2+2}\left\{\sum_{i=1}^{2} v_i^+ \cdot \frac{1}{4} + \sum_{i=1}^{2} v_i^- \cdot \frac{1}{4} + \frac{h^2}{2}(x_1^2 + x_2^2 - x_1 - x_2 - \tfrac{3}{2})\right\}.$$

$\gamma = \dfrac{2}{h^2+2}$

$l^h(x) = \frac{h^2}{2}(x_1^2 + x_2^2 - x_1 - x_2 - \frac{3}{2})$

$p^h(x \pm he_i \mid x) = \frac{1}{4}$