The steps I have taken to solve equation (1) are outlined below:

Solve for spin accumulation

$$\frac{\partial \vec{m}(x,t)}{\partial t} = -\frac{\partial \vec{j}_m}{\partial x} - \frac{\vec{m}(x,t)\times \hat{M}(x)}{\lambda_J^2} - \frac{\hat{M}(x)\times\Big(\vec{m}(x,t)\times\hat{M}(x)\Big)}{\lambda_\phi} - \frac{\vec{m}(x,t)-m_\infty}{\lambda_{sf}^2} \tag{1}$$

The derivatives can be expressed via the difference notation given below ↓

$$\frac{\partial u(x,t)}{\partial t} \approx \frac{U_i^{n+1}-U_i^n}{\Delta t}$$

$$\frac{U_i^{n+1}-U_i^n}{\Delta t} = -\frac{\partial \vec{j}_m}{\partial x} - \frac{\vec{m}(x,t)\times \hat{M}(x)}{\lambda_J^2} - \frac{\hat{M}(x)\times\Big(\vec{m}(x,t)\times\hat{M}(x)\Big)}{\lambda_\phi} - \frac{\vec{m}(x,t)-m_\infty}{\lambda_{sf}^2} \tag{2}$$

Step Taken → multiply by -Δt

$$U_i^{n+1} - U_i^n = -\Delta t\left(\frac{\partial \vec{j}_m}{\partial x} + \frac{\vec{m}(x,t)\times \hat{M}(x)}{\lambda_J^2} + \frac{\hat{M}(x)\times\Big(\vec{m}(x,t)\times\hat{M}(x)\Big)}{\lambda_\phi} + \frac{\vec{m}(x,t)-m_\infty}{\lambda_{sf}^2}\right)$$

Step Taken → take knowns to RHS

$$U_i^{n+1} = U_i^n - \Delta t\left(\frac{\partial \vec{j}_m}{\partial x} + \frac{\vec{m}(x,t)\times \hat{M}(x)}{\lambda_J^2} + \frac{\hat{M}(x)\times\Big(\vec{m}(x,t)\times\hat{M}(x)\Big)}{\lambda_\phi} + \frac{\vec{m}(x,t)-m_\infty}{\lambda_{sf}^2}\right) \tag{3}$$

Step Taken → expand out the cross products

$$U_i^{n+1} = U_i^n - \Delta t\left[\frac{\partial \vec{j}_m}{\partial x} + \frac{1}{\lambda_J^2}\begin{pmatrix} -M_yU_z^n + M_zU_y^n \\ M_xU_z^n - M_zU_x^n \\ -M_xU_y^n + M_yU_x^n \end{pmatrix} + \frac{1}{\lambda_\phi^2}\begin{pmatrix} -M_xM_yU_y^n - M_xM_zU_z^n + M_y^2U_x^n + M_z^2U_x^n \\ M_x^2U_y^n - M_xM_yU_x^n - M_yM_zU_z^n + M_z^2U_y^n \\ M_x^2U_z^n - M_xM_zU_x^n + M_y^2U_z^n - M_yM_zU_y^n \end{pmatrix} + \frac{U_i^n - |m_\infty|\hat{M}_i}{\lambda_{sf}^2}\right] \tag{4}$$

Use spin accumulation to solve for spin current

$$\vec{j}_m = \beta(x)\hat{M}j_e - 2D\left[\frac{\partial \vec{m}}{\partial x} - \beta(x)\beta'\hat{M}\left(\hat{M}\cdot\frac{\partial \vec{m}}{\partial x}\right)\right]$$