Algebra of Eqs. (10) and (11)

$$H\psi = \frac{1}{2m}\underline{\sigma}\cdot(\underline{p}-e\underline{A})\left(x+\frac{xy^2}{2}\right)\underline{\sigma}\cdot(\underline{p}-e\underline{A})\psi \quad -(1)$$

where $$x = 1-\frac{1}{4}\frac{v^2}{c^2} \quad -(2)$$

$$\frac{y}{2} = \frac{e\phi}{2mc^2} \quad -(3)$$

$$= \frac{1}{2m}\underline{\sigma}\cdot(\underline{p}-e\underline{A})\left(1-\frac{1}{4}\frac{v^2}{c^2}\right)\underline{\sigma}\cdot(\underline{p}-e\underline{A})\psi$$

$$+\frac{1}{2m}\underline{\sigma}\cdot(\underline{p}-e\underline{A})\left(1-\frac{1}{4}\frac{v^2}{c^2}\right)^2\frac{e\phi}{2mc^2}\underline{\sigma}\cdot(\underline{p}-e\underline{A})\psi \quad -(4)$$

It is seen that the g factor term is multiplied by $\left(1-\frac{1}{4}\frac{v^2}{c^2}\right)$ and the spin orbit term is multiplied by $\left(1-\frac{1}{4}\frac{v^2}{c^2}\right)^2$.