5.3 part 2 $\quad y = i\hat{r}^2/\mu_e\hat{\sigma}_x$

$$r^2 = \frac{y\mu_e\sigma_x}{i} \qquad dy = \frac{2ir\,dr}{\mu_e\hat{\sigma}_x} \Rightarrow dr = \frac{dy\,(\mu_e\hat{\sigma}_x)}{2ir}$$

$$\Rightarrow \frac{1}{2}\left[\frac{1}{\hat{r}}\frac{d}{d\hat{r}}\left(\hat{r}\,\frac{d2i\hat{r}}{dy\,\mu_e\hat{\sigma}_x}\right) - \frac{m^2 i}{y\mu_e\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) + \left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y\mu_e\hat{\sigma}_x}{\mu^2 2i\hat{\sigma}_x}\right]A_{em}(\hat{r}) = 0$$

$$= \frac{1}{2}\left[\frac{1}{\hat{r}}\frac{d}{d\hat{r}}\left(\frac{y\mu_e\hat{\sigma}_x}{y\mu i r}\right)\left(\frac{2ir\,d}{\mu_e\hat{\sigma}_x\,dy}\right) - \frac{m^2 i}{y\mu_e\hat{\sigma}_x}\right]A_{em}(\hat{r}) + \left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y\mu_e}{\mu^2 2i\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) = 0$$

$$= \frac{1}{2}\left[\frac{1}{\hat{r}}\frac{d\,2\hat{r}i}{dy\,\mu_e\hat{\sigma}_x}\left(2y\frac{d}{dy}\right) - \frac{m^2 i}{y\mu_e\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) + \left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y\mu_e}{\mu^2 2i\hat{\sigma}_x}\right]A_{em}(\hat{r}) = 0$$

$$= \left[\frac{2}{\hat{r}}\frac{i}{\mu_e\hat{\sigma}_x}\left(\frac{d}{dy}\left(2y\frac{d}{dy}\right)\right) - \frac{m^2 i}{2y\mu\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) + \left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y\mu_e}{2\mu_e 2i\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) = 0$$

$$= \left[\frac{2i}{\mu_e\hat{\sigma}_x}\left(\frac{d}{dy}\left(y\frac{d}{dy}\right)\right) - \frac{m^2 i}{2y\mu\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) + \left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y}{\mu_e 2i\sigma_x}\right]A_{em}(\hat{r}) = 0$$

$$= \left[\frac{d}{dy}\left(y\frac{d}{dy}\right) - \frac{m^2}{4y}\right]A_{em}(\hat{r}) + \frac{\mu_e\hat{\sigma}_x}{2i}\left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2} + \frac{y}{\mu_e 2i\hat{\sigma}_x}\right]A_{e,m}(\hat{r}) = 0$$

$$= \left[\frac{d}{dy}\left(y\frac{d}{dy}\right) - \frac{m^2}{4y}\right]A_{e,m}(\hat{r}) + \left[\frac{\mu_e\hat{\sigma}_x}{2i}\left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2}\right] - \frac{y}{4}\right]A_{e,m}(\hat{r}) = 0$$

$$= \left[\frac{d}{dy}\left(y\frac{d}{dy}\right) - \frac{m^2}{4y} + \frac{\mu_e\hat{\sigma}_x}{2i}\left[\mu_e\frac{\Delta\nu}{2\rho} - \frac{1}{\mu^2}\right] - \frac{y}{4}\right]A_{e,m}(\hat{r}) = 0$$