برای قرص خواهیم داشت:

پایستگی جرم $(V^z = 0)$ *:*

$$V^R \frac{\partial}{\partial R}\left(R^{3/2} - KR^{5/2}\right) + \left(R^{3/2} + KR^{5/2}\right)\left(\frac{\partial V^R}{\partial R}\right)$$
$$= -\left(R^{3/2} + KR^{5/2}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR} + \Gamma^\varphi_{\varphi R} + \Gamma^z_{zR}\right] - \Gamma^0_{r0}\right)\right\}\right.$$
$$\left. + \left\{V^R\left(\left[\Gamma^r_{rz} + \Gamma^\varphi_{\varphi z} + \Gamma^z_{zz}\right] - \Gamma^0_{z0}\right)\right\} - \left\{\Gamma^0_{R\varphi} V^\varphi V^R + \Gamma^0_{\varphi R} V^R V^\varphi\right\}\right]$$
$$- \frac{1}{(u^0)^2}\left[-2\left\{-B_\varphi J^z u^R u^0\right\}\right]$$

پایستگی تکانه شعاعی:

$$\left(R^{3/2} + KR^{5/2}\right)(u^0)^2 \frac{\partial V^R}{\partial R} V^R + \left[1 + \frac{2m}{\sqrt{R^2 + z^2}}\right]\frac{\partial (KR^{5/2})}{\partial R}$$
$$= -\left(R^{3/2} + KR^{5/2}\right)(u^0)^2\left[(\Gamma^R_{00}) - 2\Gamma^0_{0R} V^R V^R + 2V^\varphi \Gamma^R_{0\varphi} + V^t V^R (\Gamma^t_{Rt} - \Gamma^0_{Rt} V^R)\right.$$
$$\left. + V^R V^R \Gamma^R_{RR} - \Gamma^0_{\varphi R} V^R V^R V^\varphi - \Gamma^0_{R\varphi} V^R V^\varphi V^R + V^\varphi V^\varphi \Gamma^R_{\varphi\varphi}\right] - \left[B_\varphi J^z\right]$$

پایستگی تکانه زاویه ای:

$$\left(R^{3/2} + KR^{5/2}\right)(u^0)^2 \frac{\partial V^\varphi}{\partial R} V^R$$
$$= -\left(R^{3/2} + KR^{5/2}\right)(u^0)^2\left[2V^R\left(\Gamma^\varphi_{tR} - \Gamma^t_{tR} V^\varphi\right) + V^t V^R\left(\Gamma^\varphi_{Rt} - \Gamma^t_{Rt} V^\varphi\right)\right.$$
$$\left. + V^R V^\varphi\left(\Gamma^\varphi_{\varphi R} - \Gamma^t_{\varphi R} V^\varphi\right) + V^\varphi V^R\left(\Gamma^\varphi_{R\varphi} - \Gamma^t_{R\varphi} V^\varphi\right)\right]$$

پایستگی تکانه ارتفاعی:

$$as\ J^R = 0\ ,\ \frac{\partial}{\partial z} = 0\ \ ,\ \ V^z = 0\ \ \rightarrow\ \ 0 = 0$$

همینطور برای J در قرص داریم:

$$-\frac{4\pi}{c} J^z = \frac{\partial}{\partial R}\left[\left(\frac{R^2}{R^2 + 2mR + 4m^2}\right) B_\varphi(R)\right]$$
$$+ B_\varphi\left(\frac{mR(R^5 + 2R^4 m - 2R^2 a^2 m)}{R^2(R^6 - 4R^4 m^2 + 4R^2 a^2 m^2)} - \frac{m}{R(R + 2m)}\right.$$
$$\left. - \frac{m}{R(R + 2m)}\frac{R^3 m - R^4 + 2R^2 m^2 + 2a^2 m^2}{(R^4 - 4R^2 m^2 + 4a^2 m^2)}\right)\left(\frac{R^2}{R^2 + 2mR + 4m^2}\right)$$

برای قرص خواهیم داشت:

پایستگی جرم $(V^z = 0)$**:**

$$\left(\frac{\partial V^R}{\partial R}\right) = \left(R^{3/2} + KR^{5/2}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{3/2} - KR^{5/2}\right)\right.$$
$$- \left(R^{3/2} + KR^{5/2}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR} + \Gamma^\varphi_{\varphi R} + \Gamma^z_{zR}\right] - \Gamma^0_{r0}\right)\right\} + \left\{V^R\left(\left[\Gamma^r_{rz} + \Gamma^\varphi_{\varphi z} + \Gamma^z_{zz}\right] - \Gamma^0_{z0}\right)\right\}\right.$$
$$\left.\left. - \left\{\Gamma^0_{R\varphi}V^\varphi V^R + \Gamma^0_{\varphi R}V^R V^\varphi\right\}\right] - \frac{1}{(u^0)^2}\left[-2\left\{-B_\varphi J^z u^R u^0\right\}\right]\right)$$

$$\left(\frac{\partial V^R}{\partial R}\right) + \frac{1}{(u^0)^2}\frac{B_\varphi}{2\pi}\left(\frac{R^2}{R^2 + 2mR + 4m^2}\right)\frac{\partial B_\varphi(R)}{\partial R}$$
$$= \left(R^{3/2} + KR^{5/2}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{3/2} - KR^{5/2}\right)\right.$$
$$- \left(R^{3/2} + KR^{5/2}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR} + \Gamma^\varphi_{\varphi R} + \Gamma^z_{zR}\right] - \Gamma^0_{r0}\right)\right\} + \left\{V^R\left(\left[\Gamma^r_{rz} + \Gamma^\varphi_{\varphi z} + \Gamma^z_{zz}\right] - \Gamma^0_{z0}\right)\right\}\right.$$
$$\left. - \left\{\Gamma^0_{R\varphi}V^\varphi V^R + \Gamma^0_{\varphi R}V^R V^\varphi\right\}\right]$$
$$- \frac{1}{(u^0)^2}\left[-2\left\{-\frac{B_\varphi}{4\pi}\left[B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2 + 2mR + 4m^2}\right)\right.\right.\right.$$
$$+ B_\varphi\left(\frac{mR(R^5 + 2R^4m - 2R^2a^2m)}{R^2(R^6 - 4R^4m^2 + 4R^2a^2m^2)} - \frac{m}{R(R + 2m)}\right.$$
$$\left.\left.\left. - \frac{m}{R(R + 2m)}\frac{R^3m - R^4 + 2R^2m^2 + 2a^2m^2}{(R^4 - 4R^2m^2 + 4a^2m^2)}\right)\left(\frac{R^2}{R^2 + 2mR + 4m^2}\right)\right]u^R u^0\right\}\right]\Bigg)$$

$$\left(\frac{\partial V^R}{\partial R}\right) = -\frac{1}{(u^0)^2}\frac{B_\varphi}{2\pi}\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg\{\Bigg(-\frac{B_\varphi}{4\pi}\Big(1$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg)^{-1}\Bigg\{\frac{B_\varphi}{4\pi}\Big(1$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\Bigg\{B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg\}$$
$$-\Big(R^{\frac{3}{2}}$$
$$+KR^{\frac{5}{2}}\Big)(u^0)^2\Bigg(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\Bigg(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\Big[\Big\{V^R\Big(\big[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\big]-\Gamma^0_{r0}\Big)\Big\}+\Big\{V^R\Big(\big[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\big]-\Gamma^0_{z0}\Big)\Big\}$$
$$-\big\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\big\}\Big]\Bigg)\Bigg)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\big[(\Gamma^R_{00})-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^tV^R(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R)$$
$$+V^RV^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^RV^RV^\varphi-\Gamma^0_{R\varphi}V^RV^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\big]\Bigg\}\Bigg\}$$
$$=\left(R^{3/2}+KR^{5/2}\right)^{-1}\Bigg(-V^R\frac{\partial}{\partial R}\left(R^{3/2}-KR^{5/2}\right)$$
$$-\left(R^{3/2}+KR^{5/2}\right)\Big[\Big\{V^R\Big(\big[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\big]-\Gamma^0_{r0}\Big)\Big\}+\Big\{V^R\Big(\big[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\big]-\Gamma^0_{z0}\Big)\Big\}$$
$$-\big\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\big\}\Big]$$
$$-\frac{1}{(u^0)^2}\Bigg[-2\Bigg\{-\frac{B_\varphi}{4\pi}\Bigg[B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg]u^Ru^0\Bigg\}\Bigg]\Bigg)$$

پایستگی تکانه شعاعی:

$$\left(1-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\right)B_\varphi J^z$$
$$= -\Big(R^{\frac{3}{2}}$$
$$+KR^{\frac{5}{2}}\Big)(u^0)^2\Bigg(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\right]-\Gamma^0_{r0}\right)\right\}+\left\{V^R\left(\left[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\right]-\Gamma^0_{z0}\right)\right\}\right.$$
$$\left.\left.-\left\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\right\}\right]\right)\Bigg)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[(\Gamma^R_{00})-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^t V^R(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R)\right.$$
$$\left.+V^R V^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^R V^R V^\varphi-\Gamma^0_{R\varphi}V^R V^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\right]$$

$$-\frac{B_\varphi}{4\pi}\left(1-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\frac{\partial B_\varphi(R)}{\partial R}$$
$$=\frac{B_\varphi}{4\pi}\left(1-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\right)\left\{B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right.$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right\}$$
$$-\Big(R^{\frac{3}{2}}$$
$$+KR^{\frac{5}{2}}\Big)(u^0)^2\Bigg(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\right]-\Gamma^0_{r0}\right)\right\}+\left\{V^R\left(\left[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\right]-\Gamma^0_{z0}\right)\right\}\right.$$
$$\left.\left.-\left\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\right\}\right]\right)\Bigg)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[(\Gamma^R_{00})-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^t V^R(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R)\right.$$
$$\left.+V^R V^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^R V^R V^\varphi-\Gamma^0_{R\varphi}V^R V^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\right]$$

$$\frac{\partial B_\varphi(R)}{\partial R}=\left(-\frac{B_\varphi}{4\pi}\left(1-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right)^{-1}\left\{\frac{B_\varphi}{4\pi}\left(1\right.\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\left\{B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right.$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right\}$$
$$-\left(R^{\frac{3}{2}}\right.$$
$$\left.+KR^{\frac{5}{2}}\right)(u^0)^2\left(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)\right.\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\right]-\Gamma^0_{r0}\right)\right\}+\left\{V^R\left(\left[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\right]-\Gamma^0_{z0}\right)\right\}\right.$$
$$\left.\left.-\left\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\right\}\right]\right)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[\left(\Gamma^R_{00}\right)-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^tV^R\left(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R\right)\right.$$
$$\left.+V^RV^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^RV^RV^\varphi-\Gamma^0_{R\varphi}V^RV^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\right]\Big\}$$

پایستگی تکانه زاویه ای:

$$\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\frac{\partial V^\varphi}{\partial R}V^R$$
$$=-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[2V^R\left(\Gamma^\varphi_{tR}-\Gamma^t_{tR}V^\varphi\right)+V^tV^R\left(\Gamma^\varphi_{Rt}-\Gamma^t_{Rt}V^\varphi\right)\right.$$
$$\left.+V^RV^\varphi\left(\Gamma^\varphi_{\varphi R}-\Gamma^t_{\varphi R}V^\varphi\right)+V^\varphi V^R\left(\Gamma^\varphi_{R\varphi}-\Gamma^t_{R\varphi}V^\varphi\right)\right]$$

$$\frac{\partial V^\varphi}{\partial R}=\left(V^R\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)(u^0)^2\right)^{-1}\left\{-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[2V^R\left(\Gamma^\varphi_{tR}-\Gamma^t_{tR}V^\varphi\right)\right.\right.$$
$$\left.\left.+V^tV^R\left(\Gamma^\varphi_{Rt}-\Gamma^t_{Rt}V^\varphi\right)+V^RV^\varphi\left(\Gamma^\varphi_{\varphi R}-\Gamma^t_{\varphi R}V^\varphi\right)+V^\varphi V^R\left(\Gamma^\varphi_{R\varphi}-\Gamma^t_{R\varphi}V^\varphi\right)\right]\right\}$$

همینطور برای J در قرص داریم:

$$-\frac{4\pi}{c}J^z=\frac{\partial}{\partial R}\left[\left(\frac{R^2}{R^2+2mR+4m^2}\right)B_\varphi(R)\right]$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)$$

$$\left(\frac{\partial V^R}{\partial R}\right) = -\frac{1}{(u^0)^2}\frac{B_\varphi}{2\pi}\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg\{\Bigg(-\frac{B_\varphi}{4\pi}\Big(1$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg)^{-1}\Bigg\{\frac{B_\varphi}{4\pi}\Big(1$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\Bigg\{B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg\}$$
$$-\Bigg(R^{\frac{3}{2}}$$
$$+KR^{\frac{5}{2}}\Bigg)(u^0)^2\Bigg(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\Bigg(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\Big[\Big\{V^R\Big(\big[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\big]-\Gamma^0_{r0}\Big)\Big\}+\Big\{V^R\Big(\big[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\big]-\Gamma^0_{z0}\Big)\Big\}$$
$$-\big\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\big\}\Big]\Bigg)\Bigg)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\big[(\Gamma^R_{00})-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^tV^R(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R)$$
$$+V^RV^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^RV^RV^\varphi-\Gamma^0_{R\varphi}V^RV^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\big]\Bigg\}\Bigg\}$$
$$=\left(R^{3/2}+KR^{5/2}\right)^{-1}\Bigg(-V^R\frac{\partial}{\partial R}\left(R^{3/2}-KR^{5/2}\right)$$
$$-\left(R^{3/2}+KR^{5/2}\right)\Big[\Big\{V^R\Big(\big[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\big]-\Gamma^0_{r0}\Big)\Big\}+\Big\{V^R\Big(\big[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\big]-\Gamma^0_{z0}\Big)\Big\}$$
$$-\big\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\big\}\Big]$$
$$-\frac{1}{(u^0)^2}\Bigg[-2\Bigg\{-\frac{B_\varphi}{4\pi}\Bigg[B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\Bigg]u^Ru^0\Bigg\}\Bigg]\Bigg)$$

$$\frac{\partial V^\varphi}{\partial R}=\left(V^R\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)(u^0)^2\right)^{-1}\Big\{-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\big[2V^R\big(\Gamma^\varphi_{tR}-\Gamma^t_{tR}V^\varphi\big)$$
$$+V^tV^R\big(\Gamma^\varphi_{Rt}-\Gamma^t_{Rt}V^\varphi\big)+V^RV^\varphi\big(\Gamma^\varphi_{\varphi R}-\Gamma^t_{\varphi R}V^\varphi\big)+V^\varphi V^R\big(\Gamma^\varphi_{R\varphi}-\Gamma^t_{R\varphi}V^\varphi\big)\big]\Big\}$$

$$\frac{\partial B_\varphi(R)}{\partial R} = \left(-\frac{B_\varphi}{4\pi}\left(1-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right)^{-1}\left\{\frac{B_\varphi}{4\pi}\left(1\right.\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)2V^R u^R u^0\Big)\left\{B_\varphi\frac{\partial}{\partial R}\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right.$$
$$+B_\varphi\left(\frac{mR(R^5+2R^4m-2R^2a^2m)}{R^2(R^6-4R^4m^2+4R^2a^2m^2)}-\frac{m}{R(R+2m)}\right.$$
$$\left.\left.-\frac{m}{R(R+2m)}\frac{R^3m-R^4+2R^2m^2+2a^2m^2}{(R^4-4R^2m^2+4a^2m^2)}\right)\left(\frac{R^2}{R^2+2mR+4m^2}\right)\right\}$$
$$-\left(R^{\frac{3}{2}}\right.$$
$$\left.+KR^{\frac{5}{2}}\right)(u^0)^2\left(\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)^{-1}\left(-V^R\frac{\partial}{\partial R}\left(R^{\frac{3}{2}}-KR^{\frac{5}{2}}\right)\right.\right.$$
$$-\left(R^{\frac{3}{2}}+KR^{\frac{5}{2}}\right)\left[\left\{V^R\left(\left[\Gamma^R_{RR}+\Gamma^\varphi_{\varphi R}+\Gamma^z_{zR}\right]-\Gamma^0_{r0}\right)\right\}+\left\{V^R\left(\left[\Gamma^r_{rz}+\Gamma^\varphi_{\varphi z}+\Gamma^z_{zz}\right]-\Gamma^0_{z0}\right)\right\}\right.$$
$$\left.\left.-\left\{\Gamma^0_{R\varphi}V^\varphi V^R+\Gamma^0_{\varphi R}V^R V^\varphi\right\}\right]\right)V^R-\left[1+\frac{2m}{\sqrt{R^2+z^2}}\right]\frac{\partial(KR^{5/2})}{\partial R}$$
$$-\left(R^{3/2}+KR^{5/2}\right)(u^0)^2\left[(\Gamma^R_{00})-2\Gamma^0_{0R}V^R V^R+2V^\varphi\Gamma^R_{0\varphi}+V^tV^R(\Gamma^t_{Rt}-\Gamma^0_{Rt}V^R)\right.$$
$$\left.\left.+V^RV^R\Gamma^R_{RR}-\Gamma^0_{\varphi R}V^RV^RV^\varphi-\Gamma^0_{R\varphi}V^RV^\varphi V^R+V^\varphi V^\varphi\Gamma^R_{\varphi\varphi}\right]\right\}$$
