$$-\frac{G_1x_1}{r_1}\left(\frac{1}{F_{14}}\left(\frac{x_1}{2}-\frac{x_4}{2}\right)+\frac{1}{F_{13}}\left(\frac{x_1}{2}-\frac{x_3}{2}\right)+\frac{1}{F_{12}}\left(\frac{x_1}{4}-\frac{x_2}{4}\right)\right)-\frac{G_1y_1}{r_1}\left(\frac{1}{F_{14}}\left(\frac{y_1}{2}-\frac{y_4}{2}\right)+\frac{1}{F_{13}}\left(\frac{y_1}{2}-\frac{y_3}{2}\right)+\frac{1}{F_{12}}\left(\frac{y_1}{4}-\frac{y_2}{4}\right)\right)-\frac{G_1z_1}{r_1}\left(\frac{1}{F_{14}}\left(\frac{z_1}{2}-\frac{z_4}{2}\right)+\frac{1}{F_{13}}\left(\frac{z_1}{2}-\frac{z_3}{2}\right)+\frac{1}{F_{12}}\left(\frac{z_1}{4}-\frac{z_2}{4}\right)\right)-\frac{G_1}{r_1}-\frac{G_2x_2}{r_2}\left(\frac{1}{F_{24}}\left(\frac{x_2}{2}-\frac{x_4}{2}\right)+\frac{1}{F_{23}}\left(\frac{x_2}{2}-\frac{x_3}{2}\right)+\frac{1}{F_{12}}\left(-\frac{x_1}{2}+\frac{x_2}{2}\right)\right)-$$
$$\frac{G_2y_2}{r_2}\left(\frac{1}{F_{24}}\left(\frac{y_2}{2}-\frac{y_4}{2}\right)+\frac{1}{F_{23}}\left(\frac{y_2}{2}-\frac{y_3}{2}\right)+\frac{1}{F_{12}}\left(-\frac{y_1}{2}+\frac{y_2}{2}\right)\right)-\frac{G_2z_2}{r_2}\left(\frac{1}{F_{24}}\left(\frac{z_2}{2}-\frac{z_4}{2}\right)+\frac{1}{F_{23}}\left(\frac{z_2}{2}-\frac{z_3}{2}\right)+\frac{1}{F_{12}}\left(-\frac{z_1}{2}+\frac{z_2}{2}\right)\right)-\frac{G_2}{r_2}-\frac{G_3x_3}{r_3}\left(\frac{1}{F_{34}}\left(\frac{x_3}{4}-\frac{x_4}{4}\right)+\frac{1}{F_{23}}\left(-\frac{x_2}{2}+\frac{x_3}{2}\right)+\frac{1}{F_{13}}\left(-\frac{x_1}{2}+\frac{x_3}{2}\right)\right)-\frac{G_3y_3}{r_3}\left(\frac{1}{F_{34}}\left(\frac{y_3}{4}-\frac{y_4}{4}\right)+\frac{1}{F_{23}}\left(-\frac{y_2}{2}+\frac{y_3}{2}\right)+\frac{1}{F_{13}}\left(-\frac{y_1}{2}+\frac{y_3}{2}\right)\right)-$$
$$\frac{G_3z_3}{r_3}\left(\frac{1}{F_{34}}\left(\frac{z_3}{4}-\frac{z_4}{4}\right)+\frac{1}{F_{23}}\left(-\frac{z_2}{2}+\frac{z_3}{2}\right)+\frac{1}{F_{13}}\left(-\frac{z_1}{2}+\frac{z_3}{2}\right)\right)-\frac{G_3}{r_3}-\frac{G_4x_4}{r_4}\left(\frac{1}{F_{34}}\left(-\frac{x_3}{4}+\frac{x_4}{4}\right)+\frac{1}{F_{24}}\left(-\frac{x_2}{4}+\frac{x_4}{4}\right)+\frac{1}{F_{14}}\left(-\frac{x_1}{4}+\frac{x_4}{4}\right)\right)-\frac{G_4y_4}{r_4}\left(\frac{1}{F_{34}}\left(-\frac{y_3}{4}+\frac{y_4}{4}\right)+\frac{1}{F_{24}}\left(-\frac{y_2}{4}+\frac{y_4}{4}\right)+\frac{1}{F_{14}}\left(-\frac{y_1}{4}+\frac{y_4}{4}\right)\right)-\frac{G_4z_4}{r_4}\left(\frac{1}{F_{34}}\left(-\frac{z_3}{4}+\frac{z_4}{4}\right)+\frac{1}{F_{24}}\left(-\frac{z_2}{4}+\frac{z_4}{4}\right)+\frac{1}{F_{14}}\left(-\frac{z_1}{4}+\frac{z_4}{4}\right)\right)-$$
$$\frac{G_4}{r_4}+\frac{\beta}{2(\beta r_{34}+1)^3}+\frac{3\beta}{4(\beta r_{24}+1)^3}+\frac{\beta}{(\beta r_{23}+1)^3}+\frac{3\beta}{4(\beta r_{14}+1)^3}+\frac{\beta}{(\beta r_{13}+1)^3}+\frac{3\beta}{4(\beta r_{12}+1)^3}-\frac{1}{2}\left(\left(\frac{\alpha r_1}{2}-1\right)e^{-\frac{\alpha r_1}{2}}e^{-\alpha r_2}+\left(-\frac{\alpha r_2}{2}+1\right)e^{-\alpha r_1}e^{-\frac{\alpha r_2}{2}}\right)\left(-\alpha^2\left(-\frac{\alpha r_3}{2}+1\right)e^{-\frac{\alpha r_3}{2}}e^{-\alpha r_4}+\frac{\alpha^2}{4}\left(-\frac{\alpha r_4}{2}+1\right)e^{-\alpha r_3}e^{-\frac{\alpha r_4}{2}}+\frac{\alpha^2}{2}e^{-\alpha r_3}e^{-\frac{\alpha r_4}{2}}\right)-\frac{1}{2}\left(\left(\frac{\alpha r_1}{2}-1\right)e^{-\frac{\alpha r_1}{2}}e^{-\alpha r_2}+\left(-\frac{\alpha r_2}{2}+1\right)e^{-\alpha r_1}e^{-\frac{\alpha r_2}{2}}\right)\left(-\frac{\alpha^2}{4}\left(-\frac{\alpha r_3}{2}+\right.\right.$$
$$\left.\left.\frac{1}{2}\left(\left(\frac{\alpha r_3}{2}-1\right)e^{-\frac{\alpha r_3}{2}}e^{-\alpha r_4}+\left(-\frac{\alpha r_4}{2}+1\right)e^{-\alpha r_3}e^{-\frac{\alpha r_4}{2}}\right)\left(-\alpha^2\left(-\frac{\alpha r_1}{2}+1\right)e^{-\frac{\alpha r_1}{2}}e^{-\alpha r_2}+\frac{\alpha^2}{4}\left(-\frac{\alpha r_2}{2}+1\right)e^{-\alpha r_1}e^{-\frac{\alpha r_2}{2}}+\frac{\alpha^2}{2}e^{-\alpha r_1}e^{-\frac{\alpha r_2}{2}}\right)-\frac{1}{2}\left(\left(\frac{\alpha r_3}{2}-1\right)e^{-\frac{\alpha r_3}{2}}e^{-\alpha r_4}+\left(-\frac{\alpha r_4}{2}+1\right)e^{-\alpha r_3}e^{-\frac{\alpha r_4}{2}}\right)\left(-\alpha^2\left(-\frac{\alpha r_1}{2}+1\right)e^{-\frac{\alpha r_1}{2}}e^{-\alpha r_2}+\alpha^2\left(-\frac{\alpha r_2}{2}+1\right)e^{-\alpha r_1}e^{-\frac{\alpha r_2}{2}}-\frac{\alpha^2}{2}e^{-\frac{\alpha r_1}{2}}e^{-\alpha r_2}\right)-$$
$$\frac{4}{r_4}+\frac{1}{r_{34}}-\frac{4}{r_3}+\frac{1}{r_{24}}+\frac{1}{r_{23}}-\frac{4}{r_2}+\frac{1}{r_{14}}+\frac{1}{r_{13}}+\frac{1}{r_{12}}-\frac{4}{r_1}-\frac{1}{2F_{34}}-\frac{(-R_3+R_4)^2}{32F_{34}^2}-\frac{(R_3-R_4)^2}{32F_{34}^2}-\frac{3}{4F_{24}}-\frac{1}{16F_{24}F_{34}}\left(-R_2+R_4\right)\left(-R_3+R_4\right)-\frac{(-R_2+R_4)^2}{32F_{24}^2}-\frac{(R_2-R_4)^2}{8F_{24}^2}-\frac{1}{F_{23}}-\frac{1}{16F_{23}F_{34}}\left(-R_2+R_3\right)\left(R_3-R_4\right)-\frac{(R_2-R_3)(R_2-R_4)}{4F_{23}F_{24}}-\frac{(-R_2+R_3)^2}{32F_{23}^2}-$$
$$\frac{(R_2-R_3)^2}{8F_{23}^2}-\frac{3}{4F_{14}}-\frac{1}{16F_{14}F_{34}}\left(-R_1+R_4\right)\left(-R_3+R_4\right)-\frac{1}{16F_{14}F_{24}}\left(-R_1+R_4\right)\left(-R_2+R_4\right)-\frac{(-R_1+R_4)^2}{32F_{14}^2}-\frac{(R_1-R_4)^2}{8F_{14}^2}-\frac{1}{F_{13}}-\frac{1}{16F_{13}F_{34}}\left(-R_1+R_3\right)\left(R_3-R_4\right)-\frac{1}{16F_{13}F_{23}}\left(-R_1+R_3\right)\left(-R_2+R_3\right)-\frac{(R_1-R_3)(R_1-R_4)}{4F_{13}F_{14}}-\frac{(-R_1+R_3)^2}{32F_{13}^2}-\frac{(R_1-R_3)^2}{8F_{13}^2}-$$
$$\frac{3}{4F_{12}}-\frac{1}{4F_{12}F_{24}}\left(-R_1+R_2\right)\left(R_2-R_4\right)-\frac{1}{4F_{12}F_{23}}\left(-R_1+R_2\right)\left(R_2-R_3\right)-\frac{5}{32F_{12}F_{14}}\left(R_1-R_2\right)\left(R_1-R_4\right)-\frac{5}{32F_{12}F_{13}}\left(R_1-R_2\right)\left(R_1-R_3\right)-\frac{(-R_1+R_2)^2}{8F_{12}^2}-\frac{(R_1-R_2)^2}{32F_{12}^2}$$