> $restart;$

Masses of each point

> $Ma := 1.3e8;$

$$Ma := 1.3\ 10^{8} \tag{1}$$

> $Mb := 2.5e8;$

$$Mb := 2.5\ 10^{8} \tag{2}$$

> $Mc := 8.6e7;$

$$Mc := 8.6\ 10^{7} \tag{3}$$

Define a coordinate system with B at the origin (0,0).

> $Bx := 0;$

$$Bx := 0 \tag{4}$$

> $By := 0;$

$$By := 0 \tag{5}$$

> $Cx := 2.4e5;$

$$Cx := 2.4\ 10^{5} \tag{6}$$

> $Cy := 0;$

$$Cy := 0 \tag{7}$$

Define theta as the angle within the triangle at B. Then by law of cosines:

> $\text{theta} := solve\left((4.3e5)^2 = (2.4e5)^2 + (5.6e5)^2 - 2\cdot(2.4e5)\cdot(5.6e5)\cdot\cos(\text{theta}) \right);$

$$\theta := 0.8050428356 \tag{8}$$

Solve for the coordinates of point A.

> $Ax := (5.6e5)\cdot\cos(\text{theta});$

$$Ax := 3.881250000\ 10^{5} \tag{9}$$

> $Ay := (5.6e5)\cdot\sin(\text{theta});$

$$Ay := 4.036817860\ 10^{5} \tag{10}$$

Define the point of zero gravitational field strength as (Dx,Dy). In the following derivation we divide through by G m because it appears in all force terms. Then the force vector (over G m) experienced at (Dx,Dy) from asteroid A at (Ax,Ay) is:

> $Fa := \dfrac{Ma}{\left((Ax - Dx)^2 + (Ay - Dy)^2 \right)^{\frac{3}{2}}} \cdot Vector([Ax - Dx, Ay - Dy]);$

$$Fa := \begin{bmatrix} \dfrac{1.3\ 10^{8}\left(3.881250000\ 10^{5} - Dx\right)}{\left(\left(3.881250000\ 10^{5} - Dx\right)^2 + \left(4.036817860\ 10^{5} - Dy\right)^2 \right)^{3/2}} \\ \dfrac{1.3\ 10^{8}\left(4.036817860\ 10^{5} - Dy\right)}{\left(\left(3.881250000\ 10^{5} - Dx\right)^2 + \left(4.036817860\ 10^{5} - Dy\right)^2 \right)^{3/2}} \end{bmatrix} \tag{11}$$

The force vector (over G m) experienced at (Dx,Dy) from asteroid B at (0,0) is:

> $Fb := \frac{Mb}{\left((Bx-Dx)^2+(By-Dy)^2\right)^{\frac{3}{2}}} \cdot Vector([Bx-Dx, By-Dy]);$

$$Fb := \begin{bmatrix} -\frac{2.5\ 10^8\ Dx}{\left(Dx^2+Dy^2\right)^{3/2}} \\ -\frac{2.5\ 10^8\ Dy}{\left(Dx^2+Dy^2\right)^{3/2}} \end{bmatrix} \qquad \textbf{(12)}$$

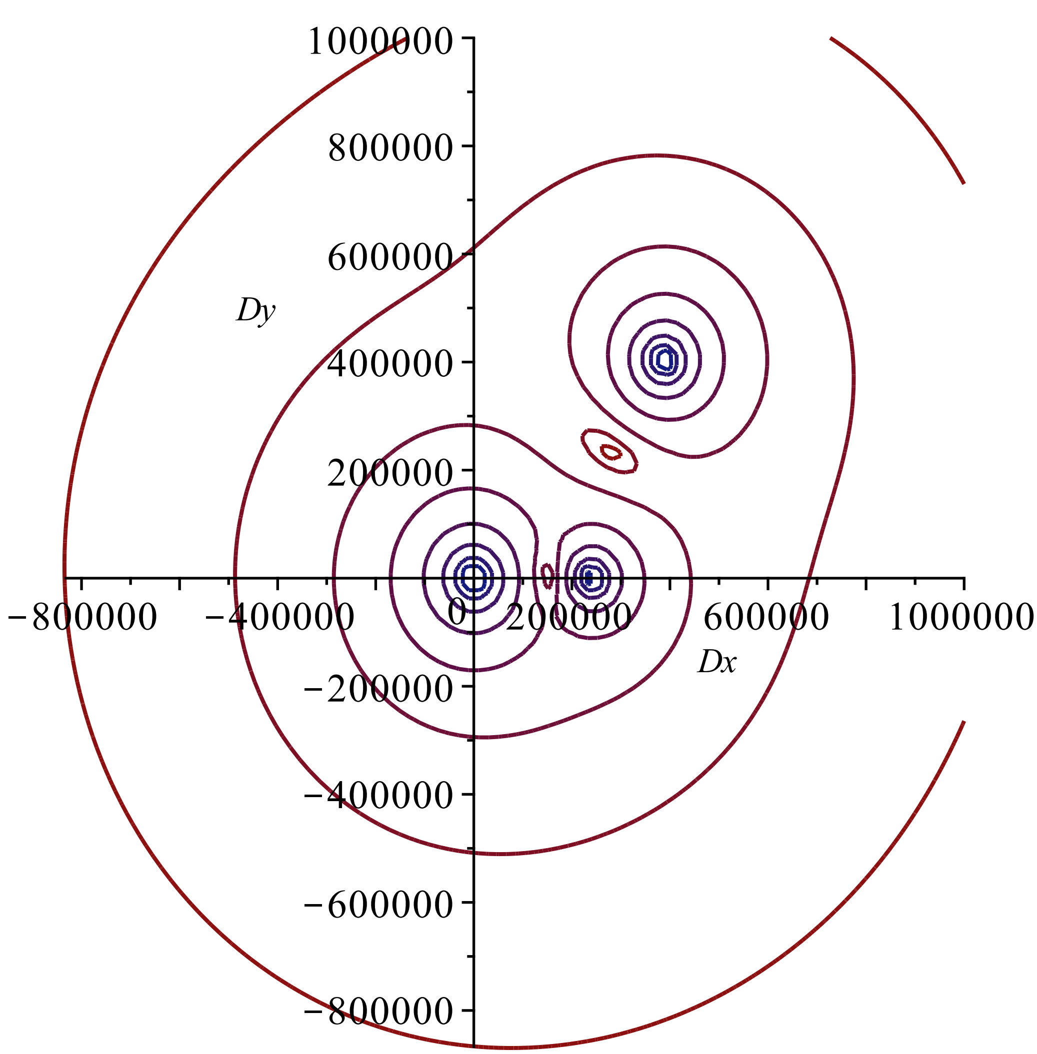
The force vector (over G m) experienced at (Dx,Dy) from asteroid C at (2.4e5,0) is:

> $Fc := \frac{Mc}{\left((Cx-Dx)^2+(Cy-Dy)^2\right)^{\frac{3}{2}}} \cdot Vector([Cx-Dx, Cy-Dy]);$

$$Fc := \begin{bmatrix} \frac{8.6\ 10^7\ \left(2.4\ 10^5 - Dx\right)}{\left(\left(2.4\ 10^5-Dx\right)^2+Dy^2\right)^{3/2}} \\ -\frac{8.6\ 10^7\ Dy}{\left(\left(2.4\ 10^5-Dx\right)^2+Dy^2\right)^{3/2}} \end{bmatrix} \qquad \textbf{(13)}$$

Let's look at a contour plot of the total acceleration experienced by an object.

> $plots[contourplot](\log(LinearAlgebra[VectorNorm](Fa+Fb+Fc, 2)), Dx = -10e5 ..10e5, Dy = -10e5 ..10e5, grid = [100, 100]);$



Solve numerically for the point (Dx,Dy) where the two components of the force vector (Fa+Fb+Fc) is zero.

> $fsolve(\{(Fa + Fb + Fc)[1], (Fa + Fb + Fc)[2]\}, \{Dx = 0, Dy = 0\});$

$$\{Dx = 1.505135703\ 10^{5}, Dy = 2665.201050\} \quad \textbf{(14)}$$

It turns out that there is a second solution which can be obtained using a different starting point

> $fsolve(\{(Fa + Fb + Fc)[1], (Fa + Fb + Fc)[2]\}, \{Dx = 3e5, Dy = 3e5\});$

$$\{Dx = 2.807474366\ 10^{5}, Dy = 2.332357058\ 10^{5}\} \quad \textbf{(15)}$$