11. (15 pts) A small bead of mass $m$ is constrained to move without friction on a rod situated halfway between two spheres each having mass $M$ as shown below:

For gravity, $V = -\frac{mMG}{r}$

for each sphere with

$r = \sqrt{d^2 + y^2}$

The rod intersects and is perpendicular to the line joining the centers of the spheres. The bead suffers a gravitational force under the action of the two spheres.

(a) (5 pts) Find the gravitational potential energy $V(y)$ of the bead as a function of $y$. Set $V(\infty) = 0$. [Recall that if two masses $m_1$ and $m_2$ are separated by a distance $\ell$, the force between them is attractive and has magnitude $m_1m_2G\ell^{-2}$ where $G$ is the gravitational constant.] Make sure you get your signs rights. Also sketch $V(y)$.

$$V(y) = -\frac{2MmG}{\sqrt{d^2+y^2}}$$