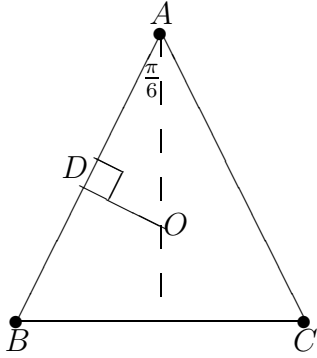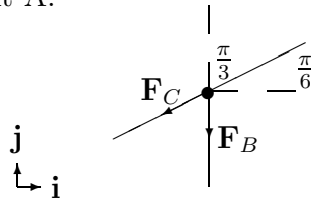**Question**

Three particles of equal mass m are placed at the corners of an equilateral triangle of side length d. Find the total gravitational force on each mass.

Answer

At A:

$$\mathbf{F}_C = \text{-}\mathbf{F}_j$$

$$\mathbf{F}_B = \text{-F}(\mathbf{i}\cos\tfrac{\pi}{6} + \mathbf{j}\sin\tfrac{\pi}{6})$$

Total force on A: $\mathbf{F} = \mathbf{F}_B + \mathbf{F}_C = -F\mathbf{j} - F\left(\mathbf{i}\dfrac{\sqrt{3}}{2} + \mathbf{j}\dfrac{1}{2}\right) = -\dfrac{F}{2}\sqrt{3}(\mathbf{i} + \sqrt{3}\mathbf{j})$

Magnitude of the force at A: $= \dfrac{F}{2}\sqrt{3} \times 2 = \sqrt{3}\dfrac{Gm^2}{d^2}$

By symmetry the forces on each of the masses has the same magnitude.