

75. The initial distance from each fixed sphere to the ball is $r_0 = \infty$, which implies the initial gravitational potential energy is zero. The distance from each fixed sphere to the ball when it is at $x = 0.30$ m is $r = 0.50$ m, by the Pythagorean theorem.

(a) With $M = 20$ kg and $m = 10$ kg, energy conservation leads to

$$K_i + U_i = K + U \implies 0 + 0 = K - 2 \frac{GmM}{r}$$

which yields $K = 2GmM/r = 5.3 \times 10^{-8}$ J.

- (b) Since the y -component of each force will cancel, the force will be $-2F_x = -2(GmM/r^2) \cos \theta$, where $\theta = \tan^{-1} 4/3 = 53^\circ$. Thus, the result (in Newtons – and using unit-vector notation) is $\vec{F}_{\text{net}} = -6.4 \times 10^{-8} \hat{i}$.