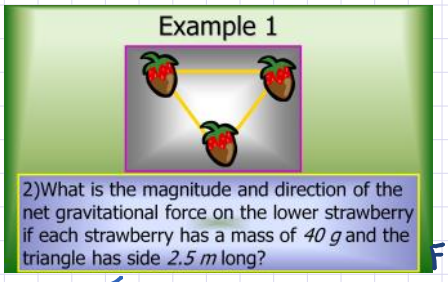
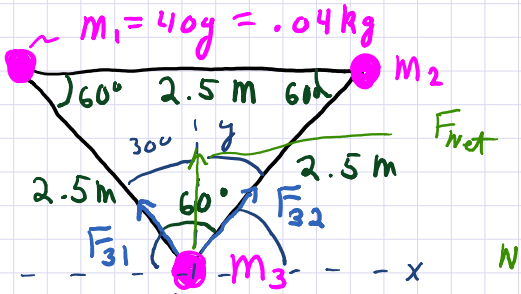
Example 1

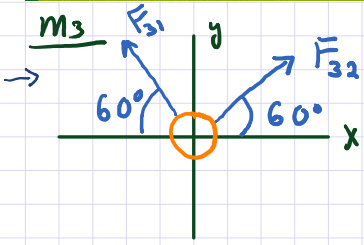
Monday, January 12, 2015 7:45 AM





$F = F_{32} = F_{31} = G\frac{m_3 m_1}{r_{31}^2} = (6.67\times10^{-11} N\frac{m^2}{kg^2})\frac{(.04kg)(.04kg)}{(2.5m)^2}$

$= 1.71\times10^{-14} N$



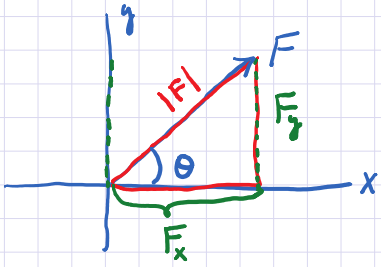
$\Sigma F = ?$

$\Sigma F_x = -F_{31}\cos(60°) + F_{32}\cos(60°) = 0$

$\Sigma F_y = F_{31}\sin(60°) + F_{32}\sin(60°) = 2F\sin(60°) =$

$2(1.71\times10^{-14} N)\sin(60°)$

$= 2.96\times10^{-14} N$



$\cos\theta = \frac{F_x}{|F|}$

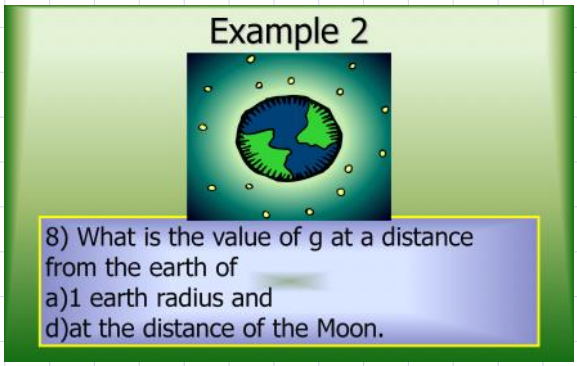
$F_x = |F|\cos\theta$

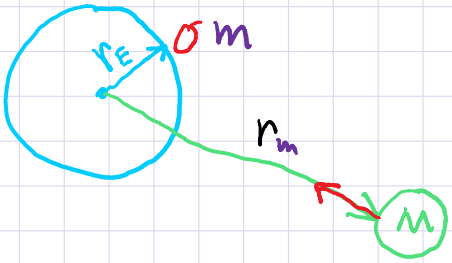
$\sin\theta = \frac{F_y}{|F|}$

$F_y = |F|\sin\theta$

Example 2

Tuesday, January 13, 2015 3:14 PM





$M_E = 5.97 \times 10^{24}$ kg

$r_E = 6.38 \times 10^6$ m

$r_{EM} = 3.84 \times 10^8$ m

$W = mg$

$W = G\frac{m\,m_E}{r_E^2}$

$mg = G\frac{m\,m_E}{r_E^2}$

$g = G\frac{m_E}{r_E^2} = \left(6.67\times10^{-11}\,N\frac{m^2}{kg^2}\right)\frac{(5.97\times10^{24}\,kg)}{(6.38\times10^6\,m)^2}$ (kg m/s²)

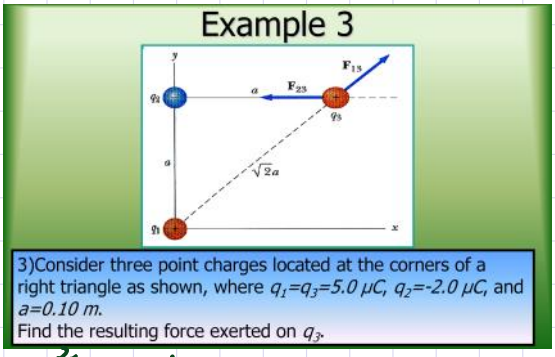
$g = 9.7827\ m/s^2 \approx 9.8\ m/s^2$

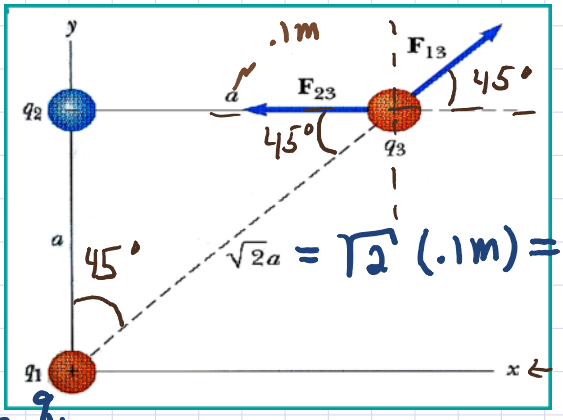
$g_m = G\frac{m_E}{r_m^2} = \left(6.67\times10^{-11}\,N\frac{m^2}{kg^2}\right)\frac{(5.97\times10^{24}\,kg)}{(6.38\times10^6\,m + 3.84\times10^8\,m)^2}$

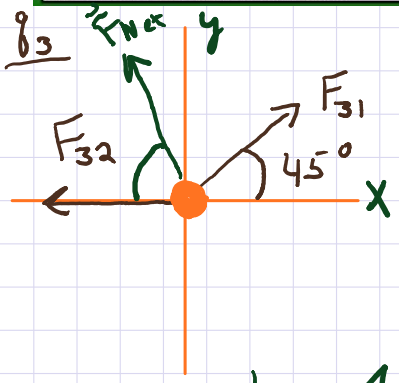
$g_m = 0.0026\ m/s^2$

Example 3

Tuesday, January 13, 2015 3:15 PM



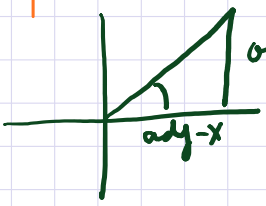




$$F_{31} = k\frac{q_3 q_1}{r_{31}^2}$$

$$F_{31} = (9\times10^9\ N\frac{m^2}{C^2})\frac{(5\times10^{-6}C)(5\times10^{-6}C)}{(.1414\ m)^2}$$

$$F_{31} = 11.253\ N$$



$$F_{32} = k\frac{q_3 q_2}{r_{32}^2}$$

$$F_{32} = (9\times10^9\ N\frac{m^2}{C^2})\frac{(5\times10^{-6}C)(2\times10^{-6}C)}{(.1\ m)^2}$$

$$F_{32} = 9N$$

$$F_{Net_x} = \Sigma F_x = -F_{32} + F_{31}\cos(45°) = -9N + (11.253\ N)\cos(45°)$$

$$F_{Net_x} = -1.04\ N$$

$$F_{Net_y} = \Sigma F_y = F_{31}\sin(45°) = (11.253\ N)\sin(45°) = 7.96\ N$$

$$|\vec{F}_{net}| = \sqrt{F_{Net_x}^2 + F_{Net_y}^2}$$

$$|F_{Net}| = \sqrt{(-1.04N)^2 + (7.96N)^2}$$

$$|F_{Net}| = 8.028\ N \approx 8.03\ N$$

$$\theta = \tan^{-1}\left(\frac{F_{Net_y}}{F_{Net_x}}\right) = \tan^{-1}\left(\frac{7.96N}{-1.04N}\right) = -82.6°$$

above (-)x-axis

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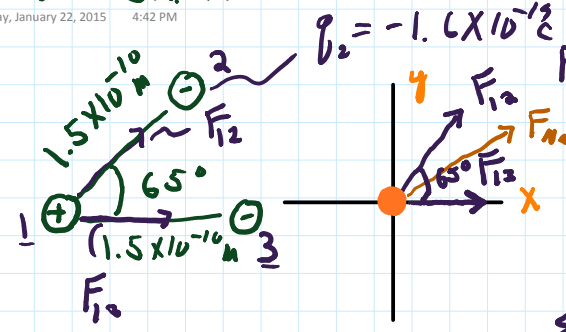
Thursday, January 22, 2015 4:42 PM



$F = F_{12} = F_{13} = k\dfrac{q_1 q_3}{r_{13}^2}$

$F = (9\times10^9\ N\dfrac{m^2}{C^2})\dfrac{(1.6\times10^{-19}\ C)(1.6\times10^{-19}\ C)}{(1.5\times10^{-10})^2}$

$F = 1.024\times10^{-8}\ N$

$\Sigma F_x = F_{13} + F_{12}\cos(65°) = F[1+\cos(65°)]$

$\Sigma F_x = (1.024\times10^{-8}\ N)[1+\cos(65°)]$

$\Sigma F_x = 1.457\times10^{-8}\ N$

$\Sigma F_y = F_{12}\sin(65°) = (1.024\times10^{-8}\ N)\sin(65°)$

$\Sigma F_y = 9.281\times10^{-9}\ N$

$|F_{net}| = \sqrt{(\Sigma F_x)^2 + (\Sigma F_y)^2}$

$|F_{net}| = \sqrt{(1.457\times10^{-8}\ N)^2 + (9.281\times10^{-9}\ N)^2}$

$|F_{net}| = 1.727\times10^{-8}\ N$

$\theta = \tan^{-1}\left(\dfrac{\Sigma F_y}{\Sigma F_x}\right) = \tan^{-1}\left(\dfrac{9.281\times10^{-9}\ N}{1.457\times10^{-8}\ N}\right)$

$\theta = 32.5°$