Gravitation Law

① $F_g = \frac{GM_e m}{r^2}$

$= \frac{(6.67\times10^{-11})(1.8\times10^{5})(1.8\times10^{5})}{94^2}$

$F_g = \boxed{244.6\ N}$

② $F_g = \frac{GM_e m}{r^2}$

$= \frac{(6.67\times10^{-11})(5.98\times10^{24})(50)}{(6.38\times10^{6})^2}$

$F_g = \boxed{490\ N}$

③ $F_g = \frac{GMm}{r^2}$

$F_g' = \frac{GMm'}{(r')^2}$

$= \frac{GM(2m)}{(3r)^2}$

$= \frac{2}{9}\frac{GMm}{r^2}$

$F_g' = \frac{2}{9}F_g$

$= \frac{2}{9}(36)$

$F_g' = \boxed{8\ N}$

④ Earth

$$F_g = \frac{GM_e}{r^2}$$

Mars

$$F_g' = \frac{G(0.11M)m}{(0.54r)^2}$$

$$= \frac{0.11}{(0.54)^2}\frac{GM_e}{r^2}$$

$$F_g' = 0.377\ F_g$$

$$= 0.377\ (600)$$

$$F_g' = \boxed{226\ N}$$

⑤ $F_g = mg$ $\quad F_g = \frac{GM_e}{r^2}$

$$mg = \frac{GM_e}{r^2}$$

$$g = \frac{(6.67\times10^{-11})(1.9\times10^{27})}{(7.2\times10^{7})^2}$$

$$g = \boxed{24.4\ m/s^2}$$

⑥ $F_g = \frac{GMm}{r^2}$

$= \frac{(6.67\times10^{-11})(5.9)(0.047)}{(0.055)^2}$

$F_g = \boxed{6.1\times10^{-9}\ N}$

⑦ $F_g = \frac{GMm}{r^2}$

$= \frac{(6.67\times10^{-11})(1.98\times10^{30})(1.9\times10^{27})}{(7.78\times10^{11})^2}$

$F_g = \boxed{4.1\times10^{23}\ N}$

⑧ $M = 2m$

$F_g = \frac{GMm}{r^2} = \frac{G(2m)m}{r^2} = \frac{2Gm^2}{r^2}$

$2.75\times10^{-12} = \frac{2(6.67\times10^{-11})m^2}{2.6^2}$

$m = \sqrt{\frac{2.6^2(2.75\times10^{-12})}{2(6.67\times10^{-11})}}$

$m = \boxed{0.37\ Kg}$ $\quad M = \boxed{0.75\ Kg}$

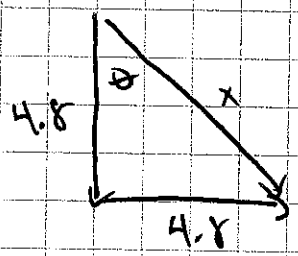
(9)

$$F_2 = \frac{G m_1 m_2}{r^2} = \frac{(6.67\times10^{-11})(3)(1)}{1^2} = 2.0\times10^{-10}\ N\ [E]$$

$$F_3 = \frac{G m_1 m_3}{r^2} = \frac{(6.67\times10^{-11})(3)(4)}{(\sqrt{2})^2} = 4.0\times10^{-10}\ N\ [SE]$$

$$F_4 = \frac{G m_1 m_4}{r^2} = \frac{(6.67\times10^{-11})(3)(1)}{1^2} = 2.0\times10^{-10}\ N\ [S]$$

	N	E
F_2	0	2.0×10^{-10}
F_3	$-4.0\times10^{-10}\sin45$	$4.0\times10^{-10}\cos45$
F_4	-2.0×10^{-10}	0
Total	-4.8×10^{-10}	4.8×10^{-10}



$$x = \sqrt{(4.8\times10^{-10})^2 + (4.8\times10^{-10})^2}$$

$$x = 6.8\times10^{-10}$$

$$\theta = \tan^{-1}\frac{4.8\times10^{-10}}{4.8\times10^{-10}} = 45^\circ$$

$$\therefore\ F_g = \boxed{6.8\times10^{-10}\ N\ [SE]}$$