Universal Law of Gravitation.

1. $m_1 = m_2 = 1.8 \times 10^8$ kg
$R = 94$ m.

$$F_g = \frac{G m_1 m_2}{R^2}$$
$$= \frac{(6.67\times10^{-11})(1.8\times10^8)(1.8\times10^8)}{(94)^2}$$
$$F_g = 244.5 \text{ N} \Rightarrow 2.4\times10^2 \text{ N}$$

2. $m_W = 50.0$ kg
$m_E = 5.98 \times 10^{24}$ kg
$R = 6.38 \times 10^8$ m

$$F_g = \frac{G m_W m_E}{R^2}$$
$$= \frac{(6.67\times10^{-11})(50.0)(5.98\times10^{24})}{(6.38\times10^6)^2}$$
$$F_g = 489.95 \text{ N} \rightarrow 490 \text{ N}$$

3. $F_{g_1} = 36$N
1) If mass doubles, force doubles $\Rightarrow F_{g_2} = 36\text{N} \times 2 = 72\text{N}$
2) If distance triples, force decreases
by a factor of $(\text{distance})^2 = 3^2 = 9 \Rightarrow F_{g_3} = \frac{72\text{N}}{9} = 8\text{N}$

4. $F_{g_1} = 600$N on Earth
1) If distance to center is 0.54 times less, then
force is decreases by a factor of $(\text{distance})^2$
$$\Rightarrow F_{g_2} = \frac{600}{(0.54)^2} = 2057.613$$

2) If mass is 0.11 times as much $\Rightarrow F_{g_3} = F_{g_2} \times 0.11$
$$= 2057.613 \text{N} \times 0.11$$
$$F_{g_3} = 226.33 \text{N}$$
$$\Downarrow$$
$$230 \text{ N}$$

acceleration due to gravity on Jupiter
$\Downarrow$

5. $$F_g = \frac{G m_J m_o}{R^2} = \frac{6.67\times10^{-11}\frac{\text{Nm}^2}{\text{kg}^2}(1.9\times10^{27}\text{kg})\, m_o}{(7.2\times10^7\text{m})^2}$$