Exam Review – Part II

4) acceleration is defined as the change in velocity; velocity can change either magnitude OR direction

Orbiting the Earth is changing direction of velocity, so satellite is accelerating

5) $F_{original} = \frac{kq_1q_2}{r^2} = 0.08\ N$

$F_{new} = \frac{kq_1q_2}{(3r)^2} = \frac{kq_1q_2}{9r^2}$

$= \frac{1}{9} F_{original} = \frac{1}{9}(0.08\ N)$

$= 0.0089\ N$

6) $F_{original} = \frac{kq_1q_2}{r^2} = 0.08\,N$

$$F_{new} = \frac{k(3q_1)q_2}{(3r)^2}$$

$$= \frac{3}{9}\frac{kq_1q_2}{r^2} = \frac{3}{9}(0.08\,N)$$

$$= 0.026\,N$$

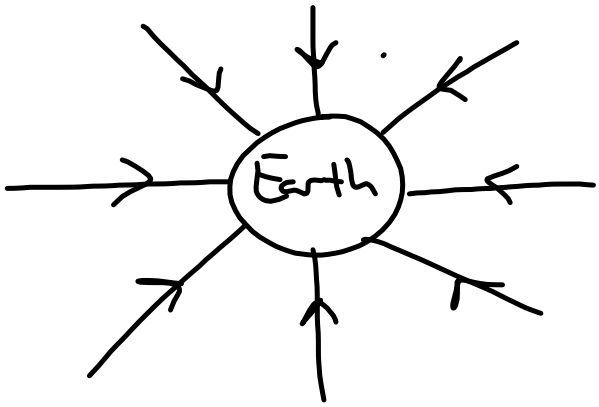
7) $g_A = \frac{Gm}{r^2} = 20\ m/s^2$

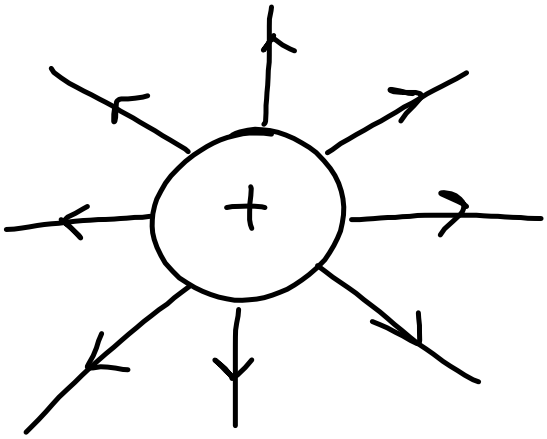
$$g_B = \frac{G(6m)}{(2r)^2}$$

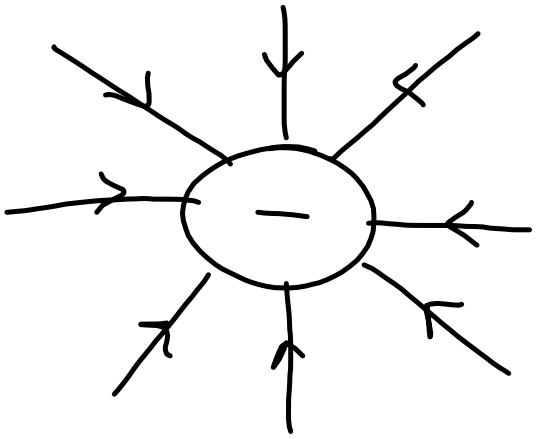
$$= \frac{6Gm}{4r^2} = \frac{6}{4} g_A = \frac{6}{4}(20\ m/s^2)$$

$$= 30\ m/s^2$$

9)







10) 1, 3, 4, 5, 6, 8, 10

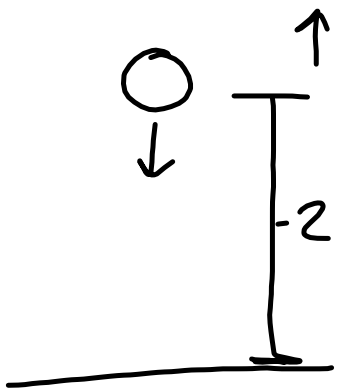
11) 2, 4, 5

12) force on golf ball is equal in magnitude to force on golf club, but opposite directions

$$F = ma$$

$$a = \frac{F}{m}$$

13)



$a_g = -3.6\ m/s^2$

$v_i = 0\ m/s$

$t = ?$

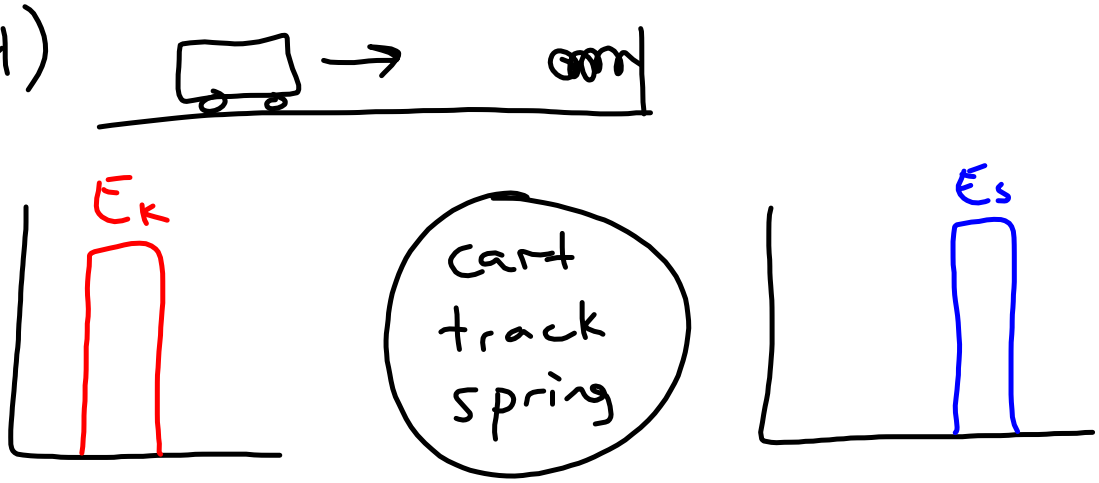
$$\Delta y = v_i t + \frac{1}{2} a_g t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_g}}$$

$$= \sqrt{\frac{2(-2m)}{(-3.6\ m/s^2)}}$$

$$= 1.05\ s$$

14)



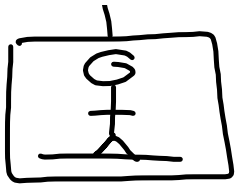
$$E_k = E_s$$

$$\frac{1}{2} m v_i^2 = \frac{1}{2} k (\Delta x)^2$$

$$k = \frac{m v_i^2}{(\Delta x)^2}$$

$$= \frac{(0.5\ kg)(3\ m/s)^2}{(0.22\ m)^2}$$

$$= 92.7\ kg/s^2$$

15) 

$\uparrow^+$

$$\sum \bar{F} = F_N - F_g$$
$$= 600\,N - 490\,N$$
$$= 110\,N$$

net force is up → acceleration is also up

$$\sum \bar{F} = m\bar{a}$$

$$\bar{a} = \frac{\sum \bar{F}}{m} = \frac{110\,N}{50\,kg} = 2.2\,m/s^2 \text{ up}$$