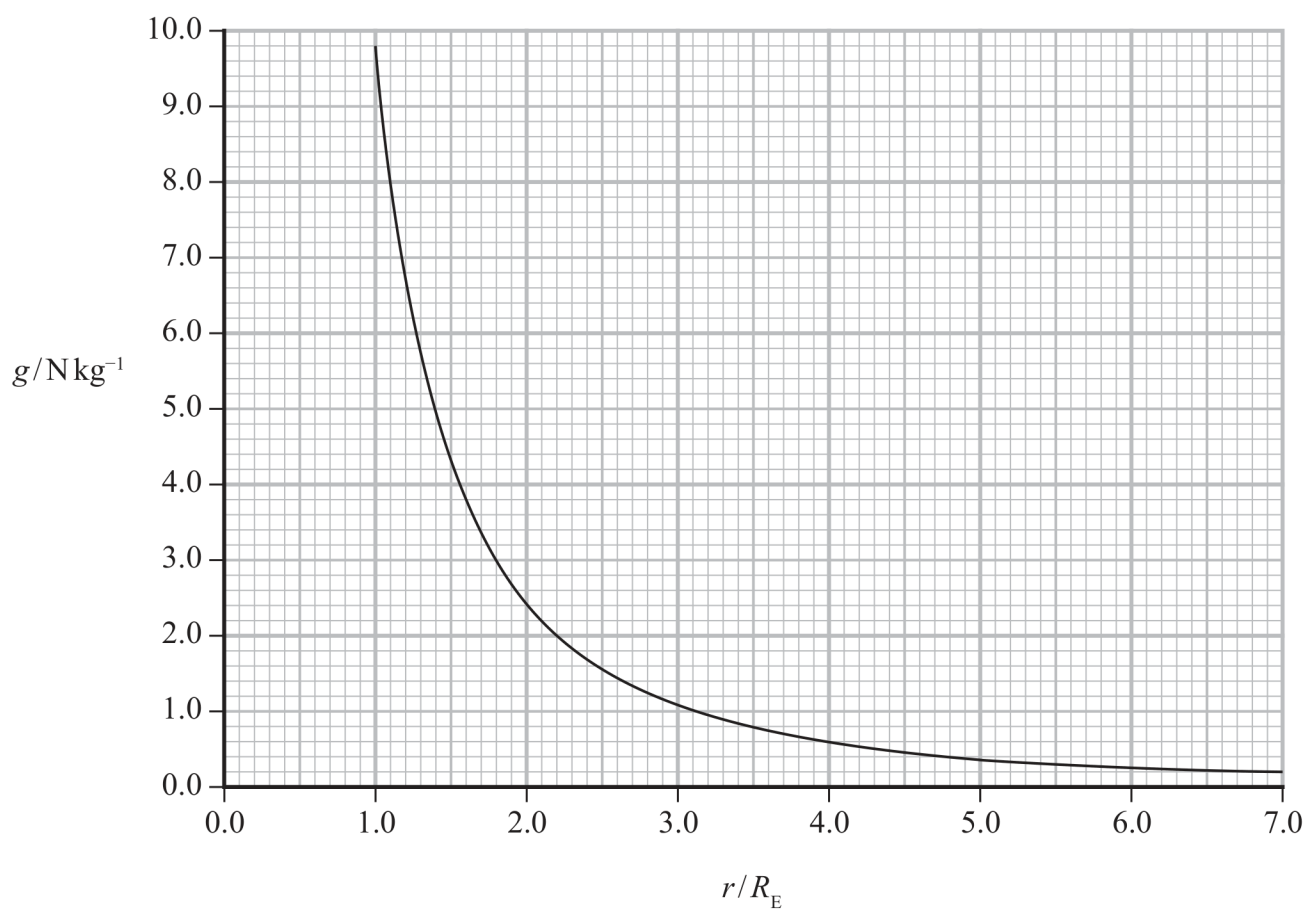


- 15 The graph shows how the gravitational field strength g of the Earth varies with distance r from the centre of the Earth.

r is given in multiples of the radius R_E of the Earth.



- (a) Show that g obeys an inverse square law.

(3)



(b) A satellite is launched from the surface of the Earth into an orbit a height $5R_E$ above the surface of the Earth.

- (i) The change in gravitational potential energy ΔE_{grav} of a mass m when it experiences a vertical displacement Δh can be calculated using the expression

$$\Delta E_{\text{grav}} = mg\Delta h$$

State why this expression cannot be used to calculate the change in the gravitational potential energy of the satellite.

(1)

- (ii) Calculate the change in gravitational potential energy of the satellite.

mass of the Earth = $6.0 \times 10^{24} \text{ kg}$

$R_E = 6.4 \times 10^6 \text{ m}$

mass of satellite = $3.5 \times 10^3 \text{ kg}$

(3)

Change in gravitational potential energy =

(Total for Question 15 = 7 marks)