1 **(a)** **(i)** State Newton's law of gravitation.

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.....

..... [2]

(ii) Use Newton's law of gravitation to show that the gravitational field strength g at a distance r away from a point mass M is given by

$$g = \frac{GM}{r^2}.$$

[2]

(b) The Earth has a mass of 5.98×10^{24} kg and a radius of 6.37×10^{6} m.
The Moon has a mass of 7.35×10^{22} kg and a radius of 1.74×10^{6} m.
The Earth and the Moon can both be considered as point masses at their centres. Their centres are a distance of 3.84×10^{8} m apart.

(i) Show that the gravitational field strength at the surface of the Moon due to the mass of the Moon is $1.62\,\text{N kg}^{-1}$.

[1]

(ii) Explain why there is a point X on the line between the centres of the Earth and the Moon where the resultant gravitational field strength due to the Earth and the Moon is zero.

.....

.....

..... [2]

(iii) Calculate the distance x of point X from the centre of the Moon.

x = ... m [3]

[Total: 10]