3(a)	force per unit mass
3(b)(i)	$F = GMm / x^2$
	$g = F / m$ $g = [GMm / x^2] / m = GM / x^2$ **and** G = gravitational constant
3(b)(ii)	arrow drawn at P pointing directly towards the point mass
3(b)(iii)	fields are in opposite directions
	field strength at Q is four times the field strength at P
3(c)	line starting at (R, $-g_0$) and ending at ($L - R$, $+g_0$)
	line passing through (L / 2, 0)
	curve becoming shallower from R to (L / 2) and then steeper from (L / 2) to ($L - R$)

A-Level Physics: **s25 44**

1(a)	force per unit mass
1(b)(i)	radial
	towards (centre of) planet
1(b)(ii)	(changes in) height (very) much smaller than radius
	(radius + height)^2 ≈ radius^2 **or** field lines are approximately parallel
1(c)(i)	$9.81 \times R^2 = 3.99 \times 10^{14}$
	$R = 6.38 \times 10^6$ m
1(c)(ii)	gravitational potential $= -(GM / R)$ $= -(3.99 \times 10^{14}) / (6.38 \times 10^6)$
	$= -6.25 \times 10^7$ J kg^{-1}
1(d)	potential (energy) zero at infinite separation
	(gravitational) force is attractive

1(a)(i)	direction of the force acting on a (test) mass placed at the point
1(a)(ii)	change in height negligible compared with radius (of Earth)
	(so) field lines are (effectively) parallel
1(b)(i)	$Y = GM / R^2$
	G is the gravitational constant
1(b)(ii)	gravitational force is (always) attractive **or** gravitational force (always) acts towards the centre of the sphere
	force is in opposite direction to displacement **or** at a point to the right of the centre, force acts to the left **or** at a point to the left of the centre, force acts to the right
1(b)(iii)	sketch: smooth curve with decreasing positive gradient, starting at (R, –Y) and reaching 3R with g still negative **or** smooth curve with increasing positive gradient, ending at (–R, Y) and reaching –3R with g still positive
	both of the above curves, in correct quadrants
	curve passing through (±2R, ±0.25Y) and (±3R, ±0.11Y)