

1(a)	work done per unit mass
	work (done in) moving mass from infinity (to the point)
1(b)(i)	evidence of addition of 3.4×10^6 to 1.7×10^6 or 6.8×10^6
	$GM \times 122 / (5.1 \times 10^6)$ or $GM \times 122 / (10.2 \times 10^6)$
	$6.67 \times 10^{-11} \times M \times 122 \times [(5.1 \times 10^6)^{-1} - (10.2 \times 10^6)^{-1}] = 5.1 \times 10^8$
	leading to $M = 6.4 \times 10^{23}$ kg
1(b)(ii)	$\phi = (-) (6.67 \times 10^{-11} \times 6.4 \times 10^{23}) / (3.4 \times 10^6)$
	$= -1.3 \times 10^7 \text{ J kg}^{-1}$
1(c)(i)	Mars takes (just under) 25 hours to rotate once on its axis
1(c)(ii)	orbit is equatorial or orbit is in same direction as direction of rotation of Mars

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2(a)	<u>sketch:</u> line from $x = R$ to $x = 4R$ entirely in the negative ϕ region
	curve with continuously decreasing magnitude and with gradient of continuously decreasing magnitude, starting at $(R, \pm\phi)$
	line passing through $(2R, \pm\frac{1}{2}\phi)$ and $(4R, \pm\frac{1}{4}\phi)$
2(b)	horizontal straight line from $t = 0$ to $t = 24$ hours
	line starting at $(0, -\phi)$
2(c)	straight line with non-zero gradient from 0 to d
	line with negative gradient from $(0, V)$ to $(d, 0)$