

TUMBLR SHIT

DIDIGODOT

(1) $K = -\frac{1}{2}U_g$

Proof.

$$\begin{aligned}K &= \frac{1}{2}mv^2 \\&= \frac{1}{2}m\left(\frac{2\pi r}{T}\right)^2 \\&= \frac{1}{2}m\left(\frac{2\pi r}{2\pi r\sqrt{\frac{r}{GM}}}\right)^2 \\&= \frac{1}{2}\frac{GMm}{r} \\&= -\frac{1}{2}\left(-\frac{GMm}{r}\right) \\&= -\frac{1}{2}U_g\end{aligned}$$

□

(2) Vector triple product:
 $(a \times b) \times c = b(a \cdot c) - c(a \cdot b)$

Proof.

$$(r' \times r'') \times r' = (r' \cdot r')r'' - (r' \cdot r'') \times r'$$

□

(3) “Integration by Differentiation”

Proof.

$$\begin{aligned} \int x^n \ln^2(x) dx \\ \frac{\partial}{\partial n} x^n &= x^n \ln(x) \\ \int x^n dx &= \frac{1}{n+1} \\ \int x^n \ln(x) dx &= -\frac{1}{(n+1)^2} \\ \int x^n \ln^2(x) dx &= \frac{2}{(n+1)^3} \end{aligned}$$

□