Vorkurs SoSe 21 Blatt 13

Aufgabe 1

Parametrisierung der x-Achse: $\vec{r}(t) = \begin{pmatrix} t \\ 0 \\ 0 \end{pmatrix}$ $\quad \frac{d\vec{r}}{dt} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ $\quad \left|\frac{d\vec{r}}{dt}\right| = 1$

$$f(\vec{r}) = f\begin{pmatrix} t \\ 0 \\ 0 \end{pmatrix} = t$$

$$\int_0^1 f(\vec{r})\, d\vec{r} = \int_0^1 f(\vec{r}) \left|\frac{d\vec{r}}{dt}\right| dt = \int_0^1 t \cdot 1\, dt = \left[\tfrac{1}{2}t^2\right]_0^1 = \frac{1}{2}$$

Aufgabe 2

$$W = \int_{t_1}^{t_2} \vec{F} \cdot d\vec{r}(t) = \int_{t_1}^{t_2} m\ddot{\vec{r}} \cdot d\vec{r}(t) = \int_{t_1}^{t_2} m\ddot{\vec{r}} \frac{d\vec{r}(t)}{dt} dt = \int_{t_1}^{t_2} m\ddot{\vec{r}} \cdot \dot{\vec{r}}\, dt = \left[\tfrac{1}{2} m \dot{\vec{r}}^2\right]_{t_1}^{t_2} = \frac{1}{2}\left(m\dot{\vec{r}}_2^2 - m\dot{\vec{r}}_1^2\right) = T_2 - T_1$$