Solved selected problems of Lagrangian and Hamiltonian by Mann

Franco Zacco

Solution. **2.2** To find the r value that corresponds to the minimum of the potential well of

$$U(r) = \frac{C}{r^{\alpha}} - \frac{D}{r^{\beta}}$$

We must derivate $U(r)$ and make it equal to zero as follows

$$\begin{aligned} \frac{\mathrm{d}U(r)}{\mathrm{d}r} = \frac{\beta D r^{-\beta} - \alpha C r^{-\alpha}}{r} &= 0 \\ \beta D r^{-\beta} &= \alpha C r^{-\alpha} \\ r^{\alpha-\beta} &= \frac{\alpha C}{\beta D} \\ r &= \left(\frac{\alpha C}{\beta D}\right)^{1/(\alpha-\beta)} \end{aligned}$$

□