Theorem 1.20.

$$\nabla \cdot \frac{\hat{r}}{r^2} = 4\pi\delta(\mathrm{r}).$$

Proof. Since r is defined as $\mathrm{r} = \mathrm{x} - \mathrm{x}'$, first choose a coordinate system in which x' is at the origin. This will not affect the equality (why?), but this will allow us to use spherical coordinates. First let's assume that $r \neq 0$. Evaluating the divergence in spherical coordinates,

$$\nabla \cdot \frac{\hat{r}}{r^2} \overset{1}{=} \frac{1}{r^2}\frac{\partial}{\partial r} r^2 \frac{1}{r^2} = \frac{1}{r^2}\frac{\partial}{\partial r}(1) = 0.$$

Therefore the divergence is zero everywhere except possibly at the origin. To check the divergence at the origin, we will perform an integral of the divergence over a sphere of radius R centered around the origin and use the Divergence Theorem.

$$\int_V \nabla \cdot \frac{\hat{r}}{r^2}\, d^3x \overset{2}{=} \int_S \frac{\hat{r}}{r^2} \cdot \hat{n}\, da = \int_S \left. \frac{\hat{r} \cdot \hat{r}}{r^2} \right|_{r=R} da$$

$$= \int_0^{2\pi} \int_0^{\pi} \frac{1}{R^2} R^2 \sin(\theta)\, d\theta d\phi = 4\pi.$$

Therefore the divergence is zero everywhere except at the origin and any integral of the divergence containing the origin yields 4π, so $\nabla \cdot \frac{\hat{r}}{r^2} = 4\pi\delta(\mathrm{r})$. □

Derivationsinphysicsclass11cbsepdfdownload

derivationsinphysicsclass11cbsepdfdownload · Osunlade-Aquarian Moon full album zip · AtomixVirtualDJ2018ProInfinityv834514InclPatchedandKe. ... key unlock code, GTA 4 CRACK PATCH - UNLOCK CODE ... da582e4974. derivationsinphysicsclass11cbsepdfdownload · download crack autocad 2013 free. Derivationsinphysicsclass11cbsepdfdownload Download Physics Notes for Class 11 PDF Chapterwise, absolutely free. All key notes are ...

d9dee69ac8