〈 Spherical Mapping 〉

⊛

$0 \le u \le 1$

$0 \le v \le 1$

$x = r\cos\pi u$

$y = r\sin\pi u \cos 2\pi v$

$z = r\sin\pi u \sin 2\pi v$

$s = u = \frac{1}{\pi}\cos^{-1}\left(\frac{x}{r}\right)$

$t = v = \frac{1}{2\pi}\tan^{-1}\left(\frac{z}{y}\right)$

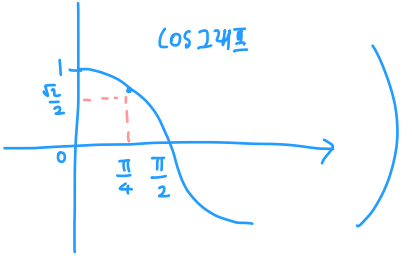
문제 → point $\left(\frac{\sqrt{2}}{2}r,\ 0,\ -\frac{\sqrt{2}}{2}r\right)$

$x \quad y \quad z$

$u = \frac{1}{\pi}\cos^{-1}\left(\frac{\sqrt{2}r}{2r}\right) = \frac{1}{\pi}\cos^{-1}\left(\frac{\sqrt{2}}{2}\right)$

⊛ $\cos\square = \frac{\sqrt{2}}{2}$

$\square = \frac{\pi}{4}$



$u = \frac{1}{\pi}\cdot\frac{\pi}{4} = \frac{1}{4}$ $\quad 0 \le u \le 1$ 이므로 $\frac{\pi}{4}$ 인가능

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$x \quad y \quad z$

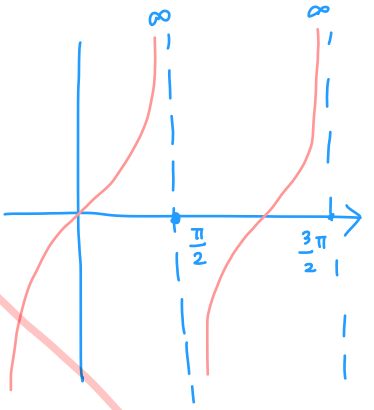
$v = \frac{1}{2\pi}\tan^{-1}\left(\frac{z}{y}\right) = \frac{1}{2\pi}\tan^{-1}\infty$

$y = 0$이므로 ∞

⊛ $\tan^{-1}\infty = \square$

$\tan\square = \infty$

$\square = \frac{\pi}{2}$ or $\frac{3}{2}\pi$



$0 \le \frac{1}{4}, \frac{3}{4} \le 1$

범위내 존재하므로 2개지 다 가능

① $\frac{\pi}{2}$인 때

$v = \frac{1}{2\pi}\cdot\frac{\pi}{2} = \frac{1}{4}$

→ $(u, v) = \left(\frac{1}{4}, \frac{1}{4}\right)$

$z(u,v) = r\sin\pi u \sin 2\pi v = r\sin\frac{\pi}{4}\cdot\sin\frac{\pi}{2} = \frac{r}{\sqrt{2}}\cdot 1 = \frac{\sqrt{2}}{2}r$

≠

다름! 1/4은 답이 아님!

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$x \quad y \quad z$

$v = \frac{1}{2\pi}\tan^{-1}\left(\frac{z}{y}\right) = \frac{1}{2\pi}\tan^{-1}\infty$

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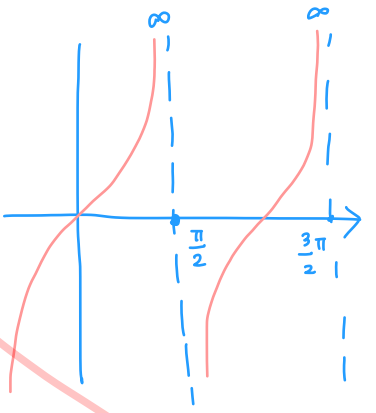

① $\frac{3}{2}\pi$ 일 때

$v = \frac{1}{2\pi}\cdot\frac{3}{2}\pi = \frac{3}{4}$

→ $(u, v) = \left(\frac{1}{4}, \frac{3}{4}\right)$

$z(u,v) = r\sin\pi u \sin 2\pi v = r\sin\frac{\pi}{4}\cdot\sin\frac{3}{2}\pi = \frac{r}{\sqrt{2}}\cdot -1 = -\frac{r}{\sqrt{2}} = -\frac{\sqrt{2}}{2}r$

같음! $v = \frac{3}{4}$ 만 가능