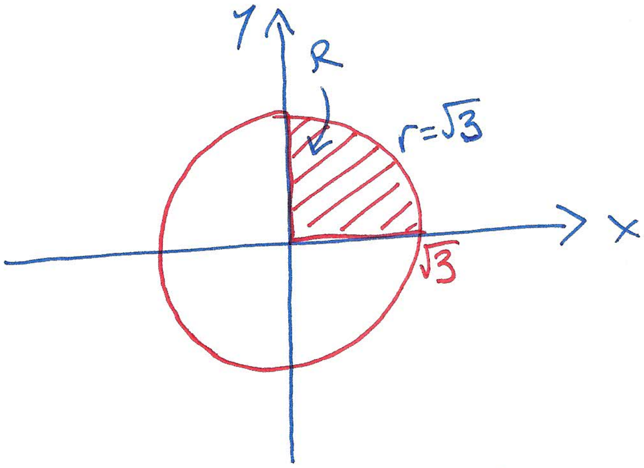
13.



We have $e^{-3(x^2+y^2)} = e^{-3[(r\cos(\theta))^2+(r\sin(\theta))^2]}$

$= e^{-3[r^2\cos^2(\theta)+r^2\sin^2(\theta)]}$

$= e^{-3r^2[\cos^2(\theta)+\sin^2(\theta)]}$

$= e^{-3r^2}$

The integral becomes

$$\int_0^{\pi/2}\int_0^{\sqrt{3}} e^{-3r^2}\, r\,dr\,d\theta$$

Let $u=-3r^2$ $\quad r=0 \to u=0$

$du=-6r\,dr$ $\quad r=\sqrt{3}\to u=-9$

$-\frac{1}{6}du = r\,dr$

$$= -\frac{1}{6}\int_0^{\pi/2}\int_0^{-9} e^{u}\,du\,d\theta$$

$$= -\frac{1}{6}\int_0^{\pi/2}\left[e^{u}\right]_{u=0}^{u=-9} d\theta$$

$$= -\frac{1}{6}\int_0^{\pi/2}\left[e^{-9}-1\right] d\theta$$

$$= \frac{1-e^{-9}}{6}\int_0^{\pi/2} d\theta$$

$$= \frac{1-e^{-9}}{6}\left[\theta\right]_0^{\pi/2}$$

$$= \frac{1-e^{-9}}{6}\left[\frac{\pi}{2}-0\right] = \frac{1-e^{-9}}{6}\cdot\frac{\pi}{2} = \boxed{\frac{\pi(e^9-1)}{12e^9}}$$