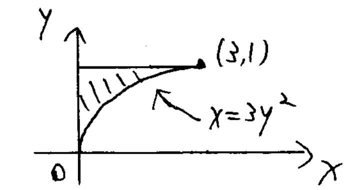
14.1-37 $\int_0^3\int_{\sqrt{\frac{x}{3}}}^1 e^{y^3}\,dy\,dx$



$= \int_0^1\int_0^{3y^2} e^{y^3}\,dx\,dy = \int_0^1 e^{y^3}\cdot 3y^2\,dy$

$= e^{y^3}\Big|_0^1 = e-1$

45 $R=\{(x,y)\mid 4-x^2-2y^2\geq 0\}$

so that $\iint_R \underbrace{(4-x^2-2y^2)}_{\geq 0}\,dA$ gives us maximum value

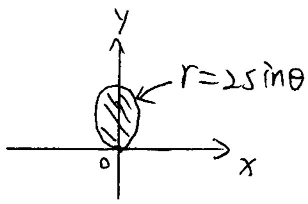
14.3-23 $\iint_{x^2+y^2\leq\frac{3}{4}} \frac{1}{1-x^2-y^2}\,dA = \int_0^{2\pi}\int_0^{\frac{\sqrt{3}}{2}} \frac{1}{1-r^2}\,r\,dr\,d\theta = \int_0^{2\pi} -\frac{1}{2}\ln(1-r^2)\Big|_0^{\frac{\sqrt{3}}{2}}\,d\theta$

$= \int_0^{2\pi} -\frac{1}{2}\ln\frac{1}{4}\,d\theta = -\pi\ln\frac{1}{4} = \pi\ln 4$

14.4-35 $D=\{(x,y,z)\mid 4x^2+4y^2+z^2-4\geq 0\}$

so that $\iiint_D \underbrace{(4x^2+4y^2+z^2-4)}_{\geq 0}\,dV$ gives us maximum value

14.6-25 $\int_0^{\pi}\int_0^{2\sin\theta}\int_0^{4-r\sin\theta} f(r,\theta,z)\,dz\,r\,dr\,d\theta$



43. $V=\int_0^{2\pi}\int_0^1\int_{-\sqrt{4-r^2}}^{\sqrt{4-r^2}} 1\,dz\,r\,dr\,d\theta = \int_0^{2\pi}\int_0^1 2\sqrt{4-r^2}\,r\,dr\,d\theta$

$= \int_0^{2\pi} -\frac{2}{3}(4-r^2)^{\frac{3}{2}}\Big|_0^1\,d\theta = \int_0^{2\pi} -\frac{2}{3}(3\sqrt{3}-8)\,d\theta = \frac{4\pi}{3}(8-3\sqrt{3})$