1. $\int\int_D x^2ydA, D$: mitad superior del disco con centro en el origen y radio 5
   - $x = r\cos(\theta)$
   - $y = r\sin(\theta)$
   - $0 \leq r \leq 5$
   - $0 \leq \theta \leq \pi$

   $\Rightarrow$
   $T : \mathbb{R}^2 \to \mathbb{R}^2$
   $T(r,\theta) = (r\cos(\theta), r\sin(\theta))$
   $\int\int_D f(x,y)dA(x,y) = \int\int_D f(T(r,\theta))|JT(u,v)|\, dA(u,v)$
   - $f(T(r,\theta)) = r^2\cos^2(\theta)r\sin(\theta) = r^3\cos^2(\theta)\sin(\theta)$

   $JT(u,v) = \left|\cos(\theta) - r\sin(\theta)\sin(\theta)r\cos(\theta)\right| = r\cos^2(\theta) + r\sin^2(\theta) = r$
   $\int_0^\pi(\int_0^5 r^3\cos^2(\theta)\sin(\theta)dr)d\theta =$
   - $\int_0^5 r^3\cos^2(\theta)\sin(\theta)dr =$
     $\left.\frac{r^4\cos^2(\theta)\sin(\theta)}{4}\right|_0^5 =$
     $\frac{625\cos^2(\theta)\sin(\theta)}{4}$
   - $\frac{625}{4}\int_0^\pi\cos^2(\theta)\sin(\theta) =$
     $\frac{625}{4} -\frac{1}{3}\cos^3(\theta)\Big|_0^\pi =$
     $\frac{625}{4}\cdot\frac{2}{3}$
2. $\int\int_D(2x-y)dA, D$: region del primer cuadrante encerrada por la circunferencia $x^2+y^2=4$, $x=0$ e $y=x$
   $D = \{(r,\theta)\in\mathbb{R}^2 : 0 \leq r \leq 2 \wedge \frac{\pi}{4} \leq \frac{\pi}{2}\}$
   $T(r,\theta) = (r\cos(\theta), r\sin(\theta))$
   $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}(\int_0^2 f(T(r,\theta))\cdot JT(r,\theta)dr)d\theta =$
   $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}(\int_0^2 2r\cos(\theta) - r\sin(\theta)\cdot rdr)d\theta$
   - $\int_0^2 2r\cos(\theta) - r\sin(\theta)\cdot rdr =$
     $\int_0^2 2r^2\cos(\theta) - r^2\sin(\theta)dr =$
     $\int_0^2 r^2(2\cos(\theta) - \sin(\theta))dr =$
     $(2\cos(\theta) - \sin(\theta))\int_0^2 r^2dr =$
     $(2\cos(\theta) - \sin(\theta))(\left.\frac{r^3}{3}\right|_0^2) =$
     $(2\cos(\theta) - \sin(\theta))\frac{8}{3} =$
     $(2\cos(\theta) - \sin(\theta))\frac{8}{3} =$
   - $\frac{8}{3}\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 2\cos(\theta) - \sin(\theta)d\theta =$
     $\frac{8}{3} -2\sin(\theta) - \cos(\theta)|_{\frac{\pi}{4}}^{\frac{\pi}{2}} =$
     $\frac{8}{3}\cdot 2\left(1 - \frac{1}{\sqrt{2}}\right) - \frac{1}{\sqrt{2}}$
3. $\int\int_D\sin(x^2+y^2)dA, D$: region del primer cuadrante encerrada por la circunferencia con centro en el origen y radios 1 y 3
   $\int_0^{\frac{\pi}{2}}(\int_1^3\sin(r^2)rdr)d\theta =$
   - $\int_1^3\sin(r^2)rdr =$
     $-\frac{1}{2}\cos(r^2)\Big|_1^3 =$
     $-\frac{1}{2}\cos(9) + \frac{1}{2}\cos(1) =$
     $\frac{1}{2}(\cos(1) - \cos(9))$

- $\frac{1}{2}(\cos(1)-\cos(9))\int_0^{\frac{\pi}{2}} 1d\theta =$
  $\frac{1}{2}(\cos(1)-\cos(9))(\frac{pi}{2})$

4. $\int\int_D e^{-x^2-y^2}dA, D:$ region acotada por las semicircunferencias $x=\sqrt{4-y^2}$ y el eje y
   $\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}}(\int_0^2 e^{-r^2}rdr)d\theta =$

   - $\int_0^2 e^{-r^2}rdr =$
     $-e^{-r^2}\Big|_0^2 =$
     $-e^{-4}-1$
   - $\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}} -e^{-4}-1d\theta =$
     $(-e^{-4}-1)\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}} 1d\theta =$
     $(-e^{-4}-1)(\frac{5\pi}{2}-\frac{3\pi}{2}) =$
     $(-e^{-4}-1)\pi$