1. $\int_1^4(\int_0^2(6x^2y-2x)dy)dx$

   - $\int_0^2(6x^2y-2x)dy=$
     $(3x^2y^2)\big|_0^2=$
     $12x^2$
   - $\int_1^4(\int_0^2(6x^2y-2x)dy)dx=$
     $\int_1^4 12x^2dx=$
     $4x^3\big|_1^4=$
     $192-4=188$

2. $\int_0^4(\int_0^2(y^3e^{2x})dy)dx$

   - $\int_0^2(y^3e^{2x})dy=$
     $\frac{y^4e^{2x}}{4}\Big|_0^2=$
     $\frac{16e^{2x}}{4}$
   - $int_0^4\frac{16e^{2x}}{4}dx$
     $8e^{2x}\big|_0^4=$
     $8e^8-8=8(e^8-1)$

3. $\int_{\frac{\pi}{2}}^{\frac{\pi}{6}}(\int_{-1}^5\cos(y)dx)dy$

   - $\int_{-1}^5\cos(y)dy=$
     $x\cos(y)|_{-1}^5=$
     $5\cos(y)+\cos(y)=6\cos(y)$
   - $\int_{\frac{\pi}{2}}^{\frac{\pi}{6}}(6\cos(y))dx$
     $6\cos(y)|_{\frac{\pi}{2}}^{\frac{\pi}{6}}=$
     $6\cos\left(\frac{\pi}{6}\right)$

4. $\int_1^3(\int_1^5\frac{\ln(y)}{xy}dy)dx$

   - $\int_1^5\frac{\ln(y)}{xy}dy$
     $u=\ln(y)$
     $du=\frac{1}{y}dy\Rightarrow dy=du\cdot y\Rightarrow$
     $\int_1^5\frac{u}{x}du=$
     $\frac{\ln(y)^2}{2x}\Big|_1^5=$
     $\frac{\ln(5)^2}{2x}-\frac{\ln(2)^2}{2x}$
   - $\int_1^3\frac{\ln(5)^2}{2x}-\frac{\ln(2)^2}{2x}dx=$
     $(\ln(5)^2-\ln(2)^2)\int_1^3\frac{1}{2x}dx=$
     $(\ln(5)^2-\ln(2)^2)\ -x^{-1}\big|_1^3=$
     $(\ln(5)^2-\ln(2)^2)(-3^{-1}+1)$