6) $\Pi = \oint\!\!\oint_{\Gamma} P\,dy\,dz + Q\,dx\,dz + R\,dx\,dy$

$$= \oint\!\!\oint_{\Gamma} \left(\frac{1}{x^2yz} + \frac{1}{x}\right)dy\,dz + \left(\frac{1}{xy^2z} + \frac{1}{y}\right)dx\,dz + \left(\frac{1}{xyz^2} + \frac{1}{z}\right)dx\,dy$$

- Проектируем сферу $x^2+y^2+z^2=1$ на xOy равен

$z = \sqrt{1-x^2-y^2}$

$p = \frac{\partial z}{\partial x} = \frac{-x}{\sqrt{1-x^2-y^2}}$, $q = \frac{\partial z}{\partial y} = \frac{-y}{\sqrt{1-x^2-y^2}}$

$$\Pi = \iint_D \left(\frac{1}{x^2\cdot y\cdot\sqrt{1-x^2-y^2}} + \frac{1}{x}, \frac{1}{xy^2\sqrt{1-x^2-y^2}} + \frac{1}{y}, \frac{1}{xy(1-x^2-y^2)} + \frac{1}{\sqrt{1-x^2-y^2}}\right)\cdot \qquad 0\le\rho\le 1$$

$0\le\varphi\le 2\pi$

$$\cdot\left(\frac{x}{\sqrt{1-x^2-y^2}}, \frac{y}{\sqrt{1-x^2-y^2}}, 1\right)dx\,dy$$

$$= \iint_D \left(\frac{x}{x^2\cdot y\cdot(1-x^2-y^2)} + \frac{x}{x\sqrt{1-x^2-y^2}} + \frac{y}{xy^2(1-x^2-y^2)} + \frac{y}{y\sqrt{1-x^2-y^2}} + \frac{1}{xy(1-x^2-y^2)} + \frac{1}{\sqrt{1-x^2-y^2}}\right)dx\,dy$$

$$= 3\cdot\iint_D \left(\frac{1}{xy(1-x^2-y^2)} + \frac{1}{\sqrt{1-x^2-y^2}}\right)dx\,dy$$

$x = \rho\cos\varphi \qquad 0<\rho\le 1$

$y = \rho\sin\varphi \qquad 0\le\varphi<2\pi$

$z = \rho$

$$= 3\int_0^{2\pi} d\varphi\cdot\int_0^1 \left(\frac{1}{\rho^2\sin\varphi\cos\varphi\cdot(1-\rho^2)} + \frac{1}{\sqrt{1-\rho^2}}\right)\rho\,d\rho =$$

$$= 3\int_0^{2\pi} d\varphi\cdot I$$

$$I_1 = \frac{1}{\sin\varphi\cos\varphi}\int_0^1 \frac{d\rho}{\rho(1-\rho^2)} \quad \left(\frac{1}{\rho} = t \quad \rho = \frac{1}{t} = d\rho = -\frac{dt}{t^2}\right) =$$

$$= \frac{1}{\sin\varphi\cos\varphi}\cdot\int \frac{\frac{dt}{t^2}}{\frac{1}{t}\cdot\left(1-\frac{1}{t^2}\right)} = -\frac{1}{\sin\varphi\cos\varphi}\cdot\int \frac{\frac{dt}{t}}{\frac{t^2-1}{t^2}} = -\frac{1}{\sin\varphi\cos\varphi}\cdot\int \frac{t\,dt}{t^2-1} =$$

$$= -\frac{1}{\sin\varphi\cos\varphi}\cdot\frac{1}{2}\int \frac{d(t^2-1)}{t^2-1} = -\frac{1}{2\sin\varphi\cos\varphi}\cdot\ln|t^2-1| = -\frac{1}{2\sin\varphi\cos\varphi}\cdot\ln\left|\frac{1}{\rho^2}-1\right|\Big|_0^1 =$$

$$= -\frac{1}{2\sin\varphi\cos\varphi}\cdot\ln|1-\rho^2|\Big|_0^1 - \ln(\rho^2)\Big|_0^1 = ???$$

ДРУГИ НАЧИН =>