19/10

$x^2+y^2 \le 4$

$0 \le r^2 \le 4$

$0 \le r \le 2$

$r\cos\alpha \le 0$

$\cos\alpha \le 0$

$\alpha \in \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$

$r\sin\alpha \ge 1$

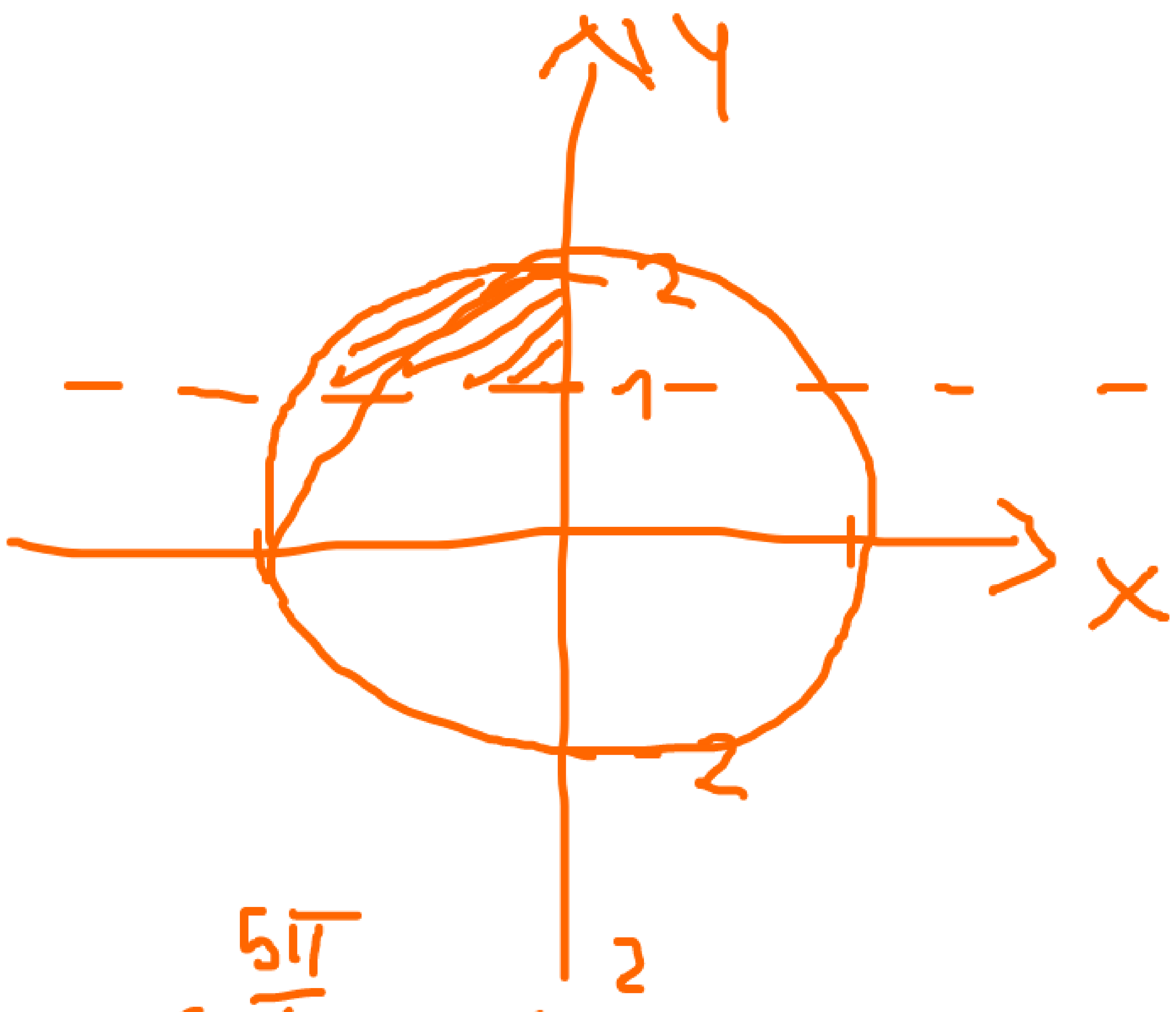
CO DALEJ, NIE WIEM

1 . . .

bo $r \le 2$

$\sin\alpha \ge \frac{1}{r} \ge \frac{1}{2}$

o, oczywiście działaje



sin

$\alpha \in \left[\frac{\pi}{6}, \frac{5\pi}{6}\right]$

$\alpha \in \left[\frac{\pi}{2}, \frac{5\pi}{6}\right]$

dodatkowo $r \ge \frac{1}{\sin\alpha}$

ups

$$\int_{\frac{\pi}{2}}^{\frac{5\pi}{6}} d\alpha \int_{\frac{1}{\sin\alpha}}^{2} \frac{1}{(r^2)^2}\, r\,dr = (\ldots)$$

$$\int_{\frac{1}{\sin\alpha}}^{2} \frac{1}{(r^2)^2}\, r\,dr = \left| \begin{array}{l} t = r^2 \\ dt = 2r\,dr \\ \frac{dt}{2} = r\,dr \end{array} \right| = \int_{\frac{1}{\sin^2\alpha}}^{4} \frac{1}{t^2}\cdot\frac{dt}{2} =$$

$$= \frac{1}{2}\left[-t^{-1}\right]_{\frac{1}{\sin^2\alpha}}^{4} = \frac{1}{2}\left[-\frac{1}{4} + \sin^2\alpha\right] = -\frac{1}{8} + \frac{\sin^2\alpha}{2}$$

$$\int_{\frac{\pi}{2}}^{\frac{5\pi}{6}} -\frac{1}{8} + \frac{\sin^2\alpha}{2} = -\frac{1}{8}\cdot\frac{5\pi}{6} + \frac{1}{8}\cdot\frac{\pi}{2} + \frac{1}{2}\int_{\frac{\pi}{2}}^{\frac{5\pi}{6}} \underbrace{\sin^2\alpha}_{=\frac{1-\cos 2\alpha}{2}} = \ldots$$

$= -\ 5$