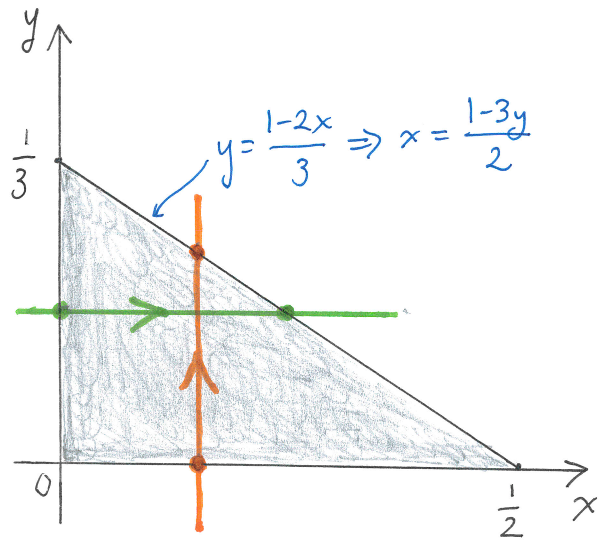
1a. Evaluate the iterated integral $\int_0^{1/2}\int_0^{(1-2x)/3} \sin(\pi x/(1-3y))\, dy\, dx$.

$$\int_0^{1/2}\int_0^{(1-2x)/3} \sin\left(\frac{\pi x}{1-3y}\right) dy\, dx = \iint_D \sin\left(\frac{\pi x}{1-3y}\right) dA = \int_0^{1/3}\int_0^{(1-3y)/2} \sin\left(\frac{\pi x}{1-3y}\right) dx\, dy$$

$$= \int_0^{1/3}\left[-\cos\left(\frac{\pi x}{1-3y}\right)\cdot\frac{1-3y}{\pi}\right]_{x=0}^{x=\frac{1-3y}{2}} dy = \int_0^{1/3}\frac{1-3y}{\pi}\, dy = \frac{1}{\pi}\left[y-\frac{3}{2}y^2\right]_0^{1/3} = \frac{1}{6\pi}$$



1b. Evaluate the double integral $\iint_D \frac{1}{(x^2+y^2)^2}\, dA$ where $D = \{(x,y) : xy \geq 1 \text{ and } x > 0\}$.

$$\iint_D \frac{1}{(x^2+y^2)^2}\, dA = \int_0^{\pi/2}\int_{\sqrt{2/\sin 2\theta}}^{\infty} \frac{1}{(r^2)^2}\cdot r\, dr\, d\theta = \int_0^{\pi/2}\left(\lim_{c\to\infty}\int_{\sqrt{2/\sin 2\theta}}^{c} r^{-3}\, dr\right) d\theta$$

$$= \int_0^{\pi/2} \lim_{c\to\infty}\left[-\frac{1}{2}r^{-2}\right]_{r=\sqrt{2/\sin 2\theta}}^{c} d\theta = \int_0^{\pi/2} \lim_{c\to\infty}\left(-\frac{1}{2}c^{-2}+\frac{1}{4}\sin 2\theta\right) d\theta$$

$$= \frac{1}{4}\int_0^{\pi/2} \sin 2\theta\, d\theta = \frac{1}{4}\left[-\frac{1}{2}\cos 2\theta\right]_0^{\pi/2} = \frac{1}{4}$$