$$\lim_{x\to 0^+}\frac{\sqrt{1-\mathrm{e}^{-x}}-\sqrt{1-\cos x}}{\sqrt{\sin x}}=\frac{\sqrt{1-(1-x+\frac{x^2}{2}+o(x^2))}-\sqrt{1-(1-\frac{x^2}{2}+o(x^2))}}{x^{\frac{1}{2}}+o(x^{\frac{1}{2}})}=$$

$$\frac{x^{\frac{1}{2}}+o(x^{\frac{1}{2}})-\sqrt{\frac{1}{2}}x+o(x)}{x^{\frac{1}{2}}+o(x^{\frac{1}{2}})}=1$$

$$I=\int_0^1\frac{\mathrm{d}x}{x+\sqrt{1-x^2}}=\int_0^1\frac{x-\sqrt{1-x^2}}{2x^2-1}\mathrm{d}x=\int_0^1\frac{\mathrm{d}(2x^2-1)}{4(2x^2-1)}-I_1$$

$$=\frac{1}{4}\ln|2x^2-1||_0^1-\int_0^{\frac{\pi}{2}}\frac{\cos^2 u\mathrm{d}u}{2sin^2u-1}=\frac{1}{4}(0-0)+\int_0^{\frac{\pi}{2}}\frac{\cos 2u+1\mathrm{d}u}{2\cos 2u}$$

$$=\frac{\pi}{4}+\frac{1}{4}\ln|\sec v+\tan v||_0^{\pi}=\frac{\pi}{4}$$

$$\sum_{n=0}^{\infty}x^n=\frac{1}{1-x}\quad\sum_{n=0}^{\infty}(n+1)x^n=\frac{1}{(1-x)^2}\quad\sum_{n=0}^{\infty}(n+2)(n+1)x^n=\frac{2}{(1-x)^3}$$

$$\sum_{n=1}^{\infty}\frac{n(n+3)}{2^n}=\sum_{n=1}^{\infty}(n^2+3n)x^n|(x=\frac{1}{2})=\frac{2}{(1-x)^3}-\frac{2}{1-x}|(x=\frac{1}{2})=(16-2)-(4-2)=12$$

$$I=\iint_D x+xyf(1+|\sin x|+\cos y)\mathrm{d}\sigma=\iint_{D_1+D_2+D_3}g_1(x,y)+g_2(x,y)\mathrm{d}\sigma=$$

$$\iint_D x\mathrm{d}\sigma+\iint_{D_1+D_2+D_3}g_2(x,y)\mathrm{d}\sigma\quad\xrightarrow{g_2(x,y)=g_2(-x,-y)}$$