(12) $$\lim_{(x,y)\to(0,0)} \frac{x^2+y^2}{\sqrt{x^2+y^2+1}-1}$$

$$\lim_{x\to 0} \frac{x^2+m^2x^2}{\sqrt{x^2+m^2x^2+1}-1} = \lim_{x\to 0} \frac{\cancel{(x^2+m^2x^2)}(\sqrt{x^2+m^2x^2+1}+1)}{\cancel{(x^2+m^2x^2)}}$$

$$\lim_{x\to 0} \sqrt{x^2+m^2x^2+1}+1 = \sqrt{1}+1 = 2$$

$$\lim_{y\to 0} \frac{m^2y^2+y^2}{\sqrt{m^2y^2+y^2+1}-1} = \lim_{y\to 0} \frac{(m^2y^2+y^2)(\sqrt{m^2y^2+y^2+1}+1)}{(m^2y^2+y^2)}$$

$$\lim_{y\to 0} \sqrt{m^2y^2+y^2+1}+1 = \sqrt{1}+1 = 2 \qquad \boxed{2}$$

(13) $z = xy \qquad x^2+y^2=1$

$\frac{\partial z}{\partial x} = y \qquad \frac{\partial z}{\partial y} = x \qquad r^2 = 1$

$r \in [0,1] \qquad \theta \in [0, 2\pi]$

$$A(S) = \sqrt{1+y^2+x^2} = \sqrt{1+r^2} \qquad \int_0^{2\pi}\int_0^1 r\sqrt{1+r^2}\,dr\,d\theta$$

$$= \int_0^{2\pi} d\theta \int_0^1 r\sqrt{1+r^2}\,dr = 2\pi \int_0^1 r\sqrt{1+r^2}\,dr = \pi \int_1^2 \sqrt{u}\,du$$

$u = 1+r^2$

$du = 2r\,dr$

$\frac{1}{2}du = r\,dr$

$$\pi\left(\frac{2}{3}(2)^{3/2} - \frac{2}{3}\right)$$

$$= \boxed{\frac{2\pi}{3}(2\sqrt{2}-1)}$$