13. $f(x,y) = \sqrt{20 - x^2 - 7y^2}$, $(2,1)$

$f(2,1) = 3$

$f_x = \dfrac{-x}{\sqrt{20-x^2-7y^2}}$ $\quad f_y = \dfrac{-7y}{\sqrt{20-x^2-7y^2}}$

$f_x(2,1) = -\frac{2}{3}$ $\quad f_y(2,1) = -\frac{7}{3}$

$L(x,y) = 3 - \frac{2}{3}(x-2) - \frac{7}{3}(y-1)$

$= -\frac{2}{3}x - \frac{7}{3}y + \frac{20}{3}$

$\boxed{L(1.99, 1.08) = 2.846}$

20. $v = y \cos xy$

$v_x = -y^2 \sin xy$ $\quad v_y = -xy \sin xy + \cos xy$

$\boxed{dv = -y^2 \sin xy \, dx + (-xy \sin xy + \cos xy)\, dy}$

22. $u = \dfrac{r}{s+2t}$

$du = u_r \, dr + u_s \, ds + u_t \, dt$

$u_r = \dfrac{1}{s+2t}$ $\quad u_s = \dfrac{-r}{(s+2t)^2}$ $\quad u_t = \dfrac{-2r}{(s+2t)^2}$

$$\boxed{du = \frac{dr}{s+2t} - \frac{r\,ds}{(s+2t)^2} - \frac{2r\,db}{(s+2t)^2}}$$