1. $x = u+3v \quad y = u-v$

$$\frac{\partial(x,y)}{\partial(u,v)} = \begin{vmatrix} 1 & 3 \\ 1 & -1 \end{vmatrix}$$

$$= 1(-1) - 1(3)$$

$$= \boxed{-4}$$

2. $x = e^u \cos v \quad y = e^u \sin v$

$$\frac{\partial(x,y)}{\partial(u,v)} = \begin{vmatrix} e^u \cos v & -e^u \sin v \\ e^u \sin v & e^u \cos v \end{vmatrix}$$

$$= e^u \cos v \, e^u \cos v - \left(e^u \sin v \left(-e^u \sin v\right)\right)$$

$$= e^{2u} \cos^2 v + e^{2u} \sin^2 v$$

$$= e^{2u}\left[\cos^2 v + \sin^2 v\right]$$

$$= \boxed{e^{2u}}$$