

Worksheet 22

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$$1. \begin{aligned} x &= 8v + 5v \\ y &= v - 2v \end{aligned}$$

$$J(v, v) = \begin{bmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ 1 & -2 \end{bmatrix} \quad -16-5$$

$$= \boxed{-2}$$

$$2. \begin{aligned} x+y &= 1 \\ x+y &= 2 \end{aligned}$$

$$u = x+y$$

$$2x-y=1$$

$$v = 2x-y$$

$$2x-y=3$$

~~$$\begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix} -1-2 = \boxed{-3}$$~~

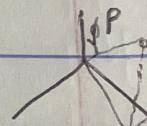
$$\iint_R \frac{x+y}{2x-y} dA$$

~~$$\begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix} -1-2 = \boxed{-3}$$~~

$$\begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix} -1-2 = \boxed{-3}$$

$$\int_1^3 \int_1^2 \frac{v}{\sqrt{v}} (-3) dv dv = \int_1^3 \frac{3v^{1/2}}{2v} dv = \int_1^3 \frac{-6}{v} - \frac{3}{2v} dv = \int_1^3 \frac{-12-3}{2v} dv = \int_1^3 \frac{-15}{2v} dv$$

$$\left. \frac{-15}{2} \ln v \right|_1^3 = \boxed{\frac{-15}{2} \ln 3}$$



$$3. \begin{aligned} x &= 2u & y &= 2v & z &= 3w \end{aligned}$$

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} = \boxed{12}$$

$$\iiint f du dv dw$$

$$\int_0^2 \int_0^1 \int_0^1 f \left(\sqrt{9 \left(1 - \frac{x^2}{4} - \frac{y^2}{4} \right)} \right) dz dy dx = \int_0^2 \int_0^1 \int_0^1 f \left(\sqrt{9 - \frac{4x^2}{4} - \frac{4y^2}{4}} \right) dz dy dx$$

$$= \frac{\sqrt{9 - u^2 - v^2}}{3} = \frac{3 - u^2 - v^2}{3}$$

$$x = p \cos \phi$$

$$y = p \sin \phi$$