

q/c Rahul Paleja

Section 22

① $\phi(r, s) = (rs, r+s)$

$x = rs$ $y = r+s$

$x_r = s$
 $x_s = r$

$y_r = 1$
 $y_s = 1$

$$\begin{vmatrix} s & 1 \\ r & 1 \end{vmatrix}$$

$$= |s - r| = \boxed{s+r}$$

② Let $D = \phi(R)$ where $\phi(u, v) = (u+v, v^2)$ &

$R = [0, 6] \times [1, 2]$

calculate $0 \leq u \leq 6$ $1 \leq v \leq 2$

$$\iint_D y \, dA$$

$x_u = 1$
 $x_v = 1$

$y_u = 0$
 $y_v = 2v$

$$\begin{vmatrix} 1 & 0 \\ 1 & 2v \end{vmatrix} = 2v$$

$$\int_0^6 \int_1^2 y \cdot 2v \, du \, dv$$

Inner:

$$2v \int_1^2 du = [2u - 1] = 1 \cdot 2v = 2v = 2v^2 = 2v^3$$

$$2v \int_0^6 v^3 \, dv = \left[\frac{v^4}{4} \right]_0^6 = \frac{6^4}{4} = \frac{2592}{4}$$

$$= \boxed{648}$$