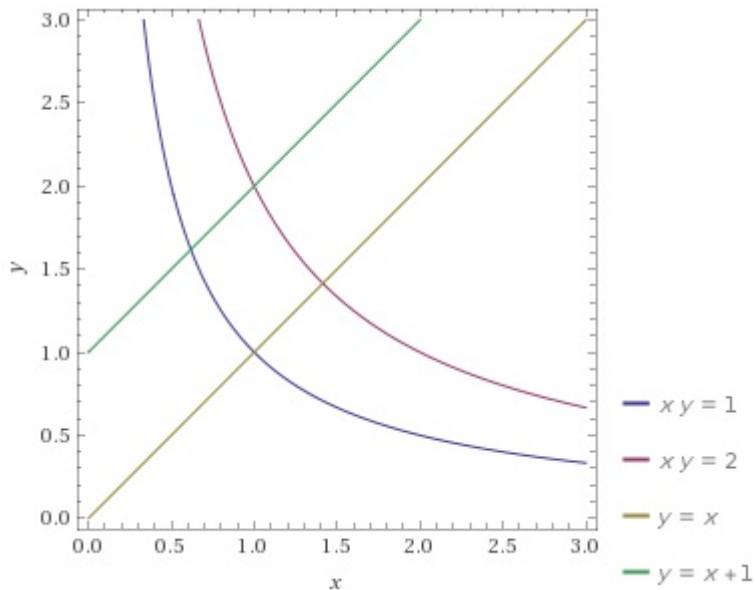


Exempel

Beräkna arean av det begränsade området i första kvadranten mellan kurvorna $xy = 1$, $xy = 2$, $y = x$ och $y = 1 + x$.

Område



$$\begin{cases} u = xy \\ v = y - x \end{cases}$$

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$$\frac{d(u, v)}{d(x, y)} = \begin{vmatrix} y & x \\ -1 & 1 \end{vmatrix} = y + x = \dots = \sqrt{v^2 + 4u}.$$

$$\iint_D dx dy = \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| du dv$$

$$\iint_D dx dy = \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| du dv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} du dv$$

$$\begin{aligned} \iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| dudv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} dudv = \\ &\iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} dudv \end{aligned}$$

$$\begin{aligned}\iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| dudv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} dudv = \\ \iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} dudv &= \int_0^1 \left(\int_1^2 \frac{1}{\sqrt{v^2 + 4u}} du \right) dv\end{aligned}$$

$$\begin{aligned}\iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| dudv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} dudv = \\ \iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} dudv &= \int_0^1 \left(\int_1^2 \frac{1}{\sqrt{v^2 + 4u}} du \right) dv = \\ \int_0^1 \left[\frac{1}{2} \sqrt{v^2 + 4u} \right]_{u=1}^2 dv\end{aligned}$$

$$\begin{aligned}\iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| dudv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} dudv = \\ \iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} dudv &= \int_0^1 \left(\int_1^2 \frac{1}{\sqrt{v^2 + 4u}} du \right) dv = \\ \int_0^1 \left[\frac{1}{2} \sqrt{v^2 + 4u} \right]_{u=1}^2 dv &= \frac{1}{2} \int_0^1 (\sqrt{v^2 + 8} - \sqrt{v^2 + 4}) dv\end{aligned}$$

$$\begin{aligned}
\iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| dudv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} dudv = \\
\iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} dudv &= \int_0^1 \left(\int_1^2 \frac{1}{\sqrt{v^2 + 4u}} du \right) dv = \\
\int_0^1 \left[\frac{1}{2} \sqrt{v^2 + 4u} \right]_{u=1}^2 dv &= \frac{1}{2} \int_0^1 (\sqrt{v^2 + 8} - \sqrt{v^2 + 4}) dv = \dots \\
\frac{1}{4} \left[v \sqrt{v^2 + 8} + 8 \ln |v + \sqrt{v^2 + 8}| \right]_0^1 & \\
- \frac{1}{4} \left[v \sqrt{v^2 + 4} - 4 \ln |v + \sqrt{v^2 + 4}| \right]_0^1 &
\end{aligned}$$

$$\begin{aligned}
\iint_D dx dy &= \iint_{\Omega} \left| \frac{d(x, y)}{d(u, v)} \right| du dv = \iint_{\Omega} \left| \frac{d(u, v)}{d(x, y)} \right|^{-1} du dv = \\
&\iint_{\Omega} \frac{1}{\sqrt{v^2 + 4u}} du dv = \int_0^1 \left(\int_1^2 \frac{1}{\sqrt{v^2 + 4u}} du \right) dv = \\
&\int_0^1 \left[\frac{1}{2} \sqrt{v^2 + 4u} \right]_{u=1}^2 dv = \frac{1}{2} \int_0^1 (\sqrt{v^2 + 8} - \sqrt{v^2 + 4}) dv = \dots \\
&\frac{1}{4} \left[v \sqrt{v^2 + 8} + 8 \ln |v + \sqrt{v^2 + 8}| \right]_0^1 \\
&- \frac{1}{4} \left[v \sqrt{v^2 + 4} - 4 \ln |v + \sqrt{v^2 + 4}| \right]_0^1 = \\
&\frac{1}{4} \left(3 - \sqrt{5} + 4 \ln \frac{4}{1 + \sqrt{5}} \right) \approx 0.4.
\end{aligned}$$