

- 1) Estimate the volume of the solid that lies below the surface $z = xy$ and above the rectangle

$R = \{(x, y) | 0 \leq x \leq 6, 0 \leq y \leq 4\}$ use a Riemann sum with $m = 3$, $n = 2$, and take the sample point to be the upper right corner of each square.

$$V \approx 288$$

- 2) Use the Midpoint Rule to estimate the volume of the solid in problem 1.

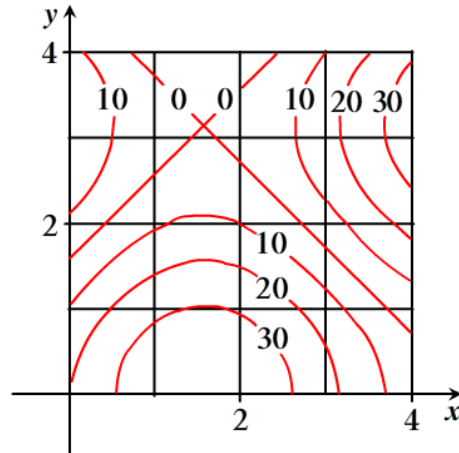
$$V \approx 144$$

- 3) Use Riemann sum with $m = n = 2$ to estimate the value of $\iint_R \sin(x + y) \, dA$, where $R = [0, \pi] \times [0, \pi]$. Take the sample points to be lower left corners.

$$V \approx \frac{\pi^2}{2}$$

4) A contour map is shown for a function f on the square $R = [0, 4] \times [0, 4]$.

- a) Use the Midpoint Rule with $m = n = 2$ to estimate the value of $\iint_R f(x, y) dA$.
- b) Estimate the average value of f .



- a) $V \approx 248$
- b) $f_{ave} \approx 15.5$

5) Evaluate the double integral by first identifying it as the volume of a solid.

- a) $\iint_R 3 dA$, $R = \{(x, y) \mid -2 \leq x \leq 2, 1 \leq y \leq 6\}$
- b) $\iint_R (4 - 2y) dA$, $R = [0, 1] \times [0, 1]$

- a) $V = 60$
- b) $V = 3$