Section 15.1 - Double Integrals over Rectangles

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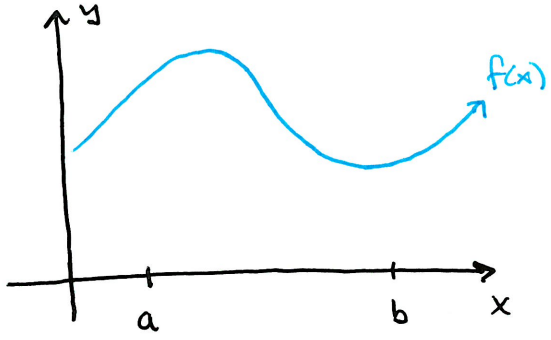
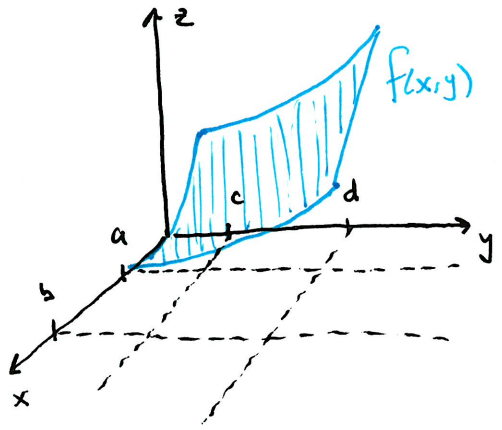
- Review the Definite Integral:



★ Watch Riemann Sum Demo on Website

- Volumes and double Integrals:



Visual ★ See Double Integral demo on website

- Volume of a rectangular cylinder:

- Approximate Volume under $f(x,y)$:

- Exact Volume under $f(x,y)$:

The double Integral of f over $R = [a,b] \times [b,c] =$

? Warning:

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Example Estimate the volume of the solid that lies above the square $R = [0,2] \times [0,2]$ and below $z = 16 - x^2 - 2y^2$ by dividing R into 4 equal squares and choosing the upper right corner of each square for taking the height of the rectangular prism. Compare this approximation to the midpoint approximation.

- Average Value of $f(x)$:
  on $[a,b]$
- Average Value of $f(x,y)$:
  on R
- Properties of Double Integrals:

  ①

  ②

  ③

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- Extra Examples

#7 Let V be the volume of the solid under $f(x,y) = \sqrt{52 - x^2 - y^2}$ and above the rectangle given by $2 \le x \le 4$, $2 \le y \le 6$. Use $x = 3$, $y = 4$ to divide R into subrectangles. Without computing the Riemann sums with the lower left corner (L) and the upper right corner (R) arrange V, L, R in increasing order.

#12 Evalute the double integral by identifying it as the volume of a solid,
$\iint_R (5 - x)\,dA$ where $R = [0,5] \times [0,3]$.

#17 If f is a constant function $f(x,y) = k$ and $R = [a,b] \times [c,d]$
Show that $\iint_R k\,dA = k(b-a)(d-c)$