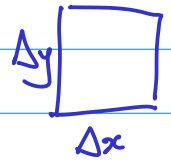
Intro given. See blackboard & webpage for MA212.

Target: Compute $\int_0^3 \int_1^2 x^2 y \, dy \, dx$.

Here $f(x,y) = x^2 y$ and $\iint f(x,y)\, dy\, dx$



Area element $\Delta A = \Delta x \Delta y$

Similarly $dA \sim dx\,dy$

dx is like an infinitesimally small Δx.

Write $\iint f(x,y)\, dA$ "double-integral of f"

Recall: 1-variable integration:

e.g. $\int x^3 dx = \frac{x^4}{4} + C$; $\int_0^2 x^3 dx = \frac{x^4}{4}\Big]_0^2$

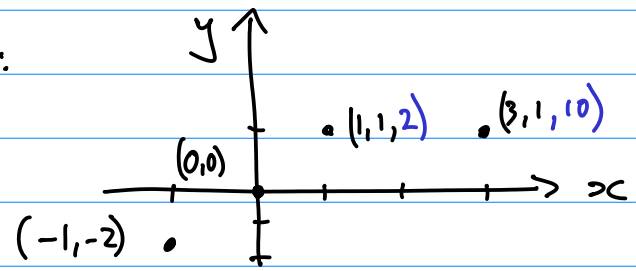
$\frac{2^4}{4} - \frac{0^4}{4} = \frac{16}{4} - 0 = 4$

e.g. $\int x^3 dy$. Makes sense?

Recall: Function of 2-variables

e.g. $f(x,y) = x^2 + y^2$

graph:

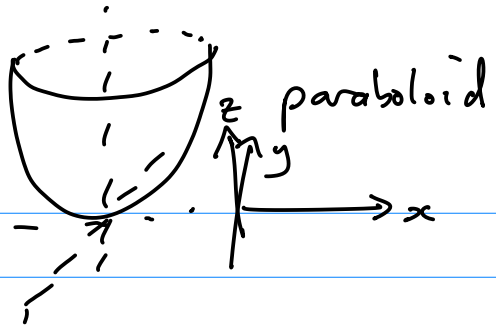


$f(0,0) = 0$

$f(1,1) = 2$

$f(3,1) = 10$

$f(-1,-2) = 5$


paraboloid
z
y
x