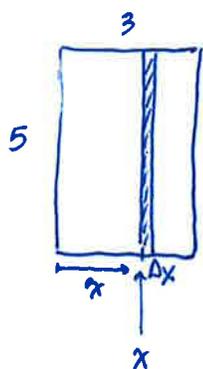


## Density, Mass, Etc.

1. A rectangular sheet of strange material measures  $3 \times 5$ .  
 (#6, p.446) The density per unit area at distance  $x$  from one of sides of length 5 is  $\frac{1}{1+x^4}$ .



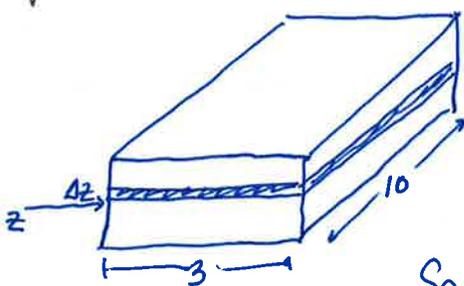
Set up an integral to calculate the mass. (Make a sketch!)

Slice at distance  $x$  from side length 5; obtain slice of thickness  $\Delta x$  and density  $\approx \frac{1}{1+x^4}$ .

So mass of slice  $\approx$  (density)  $\times$  (area)  $= \frac{1}{1+x^4} (5 \Delta x)$ .

So mass of sheet is  $\int_0^3 \frac{5}{1+x^4} dx$ .

2. Find the mass of the block  $0 \leq x \leq 10$ ,  $0 \leq y \leq 3$ ,  $0 \leq z \leq 1$   
 (#9, p.446) with density  $\delta$  given by  $\delta = 2 - z$ , for  $0 \leq z \leq 1$ .



Density depends only on  $z$ , so we slice at "height"  $z$  with thickness  $\Delta z$ .

Mass of slice  $\approx$  (density)  $\times$  (volume)

$$= (2-z)(3)(10)\Delta z = 30(2-z)\Delta z.$$

So volume of solid is  $\int_0^1 (60 - 30z) dz$

$$= (60z - 15z^2) \Big|_0^1 = 45 \text{ cubic units}$$

3. If you have your text, look at #'s 10 and 11 in § 8.4