

halbainija 20 cm  $\Rightarrow$  säde:  $\frac{20\text{cm}}{2} = 10\text{ cm}$   
 $x$ : kivan paksuus renkaasta (0...10)

a) Kertymäfunktio  $F(x) = P(\underline{X} \leq x)$

$$x \leq 0 : F(x) = P(\underline{X} \leq x) = 0$$

$$x \geq 10 : F(x) = P(\underline{X} \leq x) = 1$$

$$0 < x < 10 : F(x) = P(\underline{X} \leq x) = \frac{A_1}{A_0} = \frac{\pi 10^2 - \pi (10-x)^2}{\pi 10^2}$$

glom. th.

$$= \frac{100 - (100 - 20x + x^2)}{100} = -\frac{x^2}{100} + \frac{1}{5}x$$

$$\Rightarrow F(x) = \begin{cases} 0 & , x \leq 0 \\ -\frac{1}{100}x^2 + \frac{1}{5}x & , 0 < x < 10 \\ 1 & , x \geq 10 \end{cases} \quad (\text{kertymäfunktio})$$

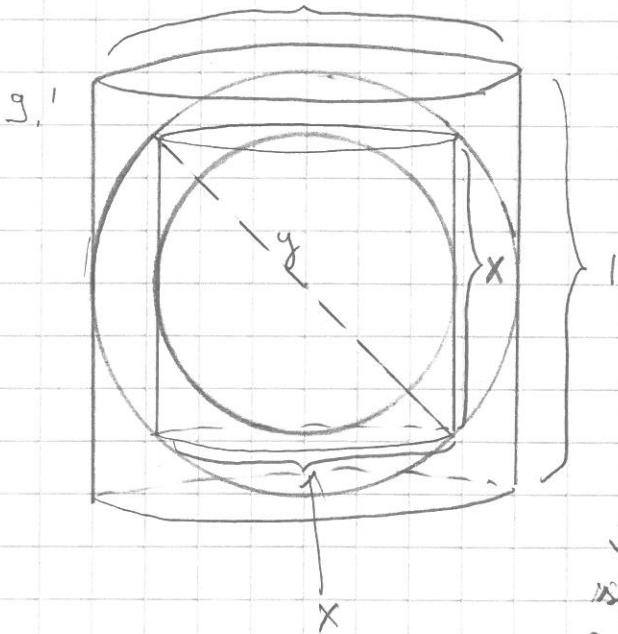
b)

$$f(x) = F'(x) = \begin{cases} -\frac{1}{50}x + \frac{1}{5} & , 0 < x < 10 \\ 0 & , x \leq 0 \text{ tai } x \geq 10 \end{cases} \quad (\text{tiheysfunktio})$$

c)

$$E(\underline{X}) = \int_{-\infty}^{\infty} x f(x) dx = \int_0^{10} x \left(-\frac{1}{50}x + \frac{1}{5}\right) dx = \dots = \frac{10}{3} \approx 3,3 \text{ (cm)}$$

(odotusarvo)



1. pallo : halbainija : 1

$$y = 1 \quad \text{Pythagoras: } x^2 + x^2 = y^2 = 1^2$$

$$\Rightarrow 2x^2 = 1 \quad (\Rightarrow) x^2 = \frac{1}{2} \quad (\sqrt{\quad})$$

$$\Rightarrow x = \pm \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}} (\approx 0,71)$$

2. pallo : halbainija :  $\frac{1}{\sqrt{2}}$

Tilanne toistuu aina samanlaisena :  
 suuremman pallon halbainija (säde) on  
 aina  $\frac{1}{\sqrt{2}}$  edellisemmän pallon halbainija (säde)

a) Pinta-alojen summa:  $(A_p = 4\pi r^2)$

$$4\pi \left(\frac{1}{2}\right)^2 + 4\pi \left(\frac{1}{2} \cdot \frac{1}{\sqrt{2}}\right)^2 + 4\pi \left(\frac{1}{2} \cdot \left(\frac{1}{\sqrt{2}}\right)^2\right)^2 + \dots = \frac{4\pi \left(\frac{1}{2}\right)^2}{1 - \frac{1}{2}} = \frac{\pi}{\frac{1}{2}} = 2\pi$$

$\cdot \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2}$        $\cdot \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2}$

geom. sarja suppenee koska  
 $|q| = \left|\frac{1}{2}\right| = \frac{1}{2} < 1$