

## 1st lesson

<https://www2.karlin.mff.cuni.cz/~kuncova/en/teachMat1.php>  
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### Exercises

1. Sketch a picture and decide, which formulae defines a function:

- |                  |                        |                                       |
|------------------|------------------------|---------------------------------------|
| (a) $y = x^2$    | (g) $y = \sqrt{x}$     | (m) $\lfloor x \rfloor$ (floor $x$ )  |
| (b) $x = y^2$    | (h) $x = \sqrt{y}$     | (n) $x - \lfloor x \rfloor$           |
| (c) $x = y^3$    | (i) $y =  x + 2 $      | (o) $\operatorname{sgn} x$            |
| (d) $x = \sin y$ | (j) $(x - 3)^3$        | (p) $(x^2 + y^2 - 1)^3 - x^2 y^3 = 0$ |
| (e) $y = e^x$    | (k) $x^2 + y^2 = 4$    |                                       |
| (f) $y = \tan x$ | (l) $4x^2 + 9y^2 = 36$ |                                       |

2. Precise the definition of a function  $f$

- (a)  $f$  takes degrees in Fahrenheit and gives degrees of Celsia,
  - (b) value added tax,
  - (c)  $f$  assigns height of present students,
  - (d) price of watermelons in your grocery,
  - (e) compound interest.
3. Find  $f((0; 4))$ ,  $f([-1; 4))$ ,  $f(\{4\})$  and  $f^{-1}((0; 4))$ ,  $f^{-1}((0; 4])$ ,  $f^{-1}((-4; 0])$ ,  $f^{-1}(\{0\})$  for functions:

- |               |                     |                   |
|---------------|---------------------|-------------------|
| (a) $f = x$   | (c) $f = 4\sqrt{x}$ | (e) $f =  x + 1 $ |
| (b) $f = x^2$ | (d) $f = 4$         |                   |

4. Find (or sketch) a function which maps

- |  |                            |
|--|----------------------------|
| (a) $[0; 1]$ onto $[0; 2]$                                     | (d) $(0; 1)$ onto $[0; 1]$ |
| (b) $[0; \frac{\pi}{2})$ onto $[0; \infty)$                    |                            |
| (c) $(-\frac{\pi}{2}; \frac{\pi}{2})$ onto $(-\infty; \infty)$ | (e) $[a; b]$ onto $[0; 1]$ |