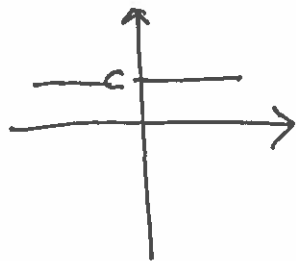


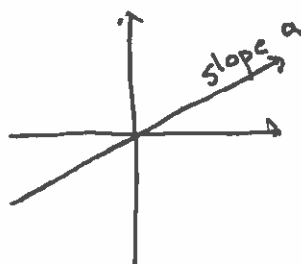
Section 1.4

Catalog of basic graphs

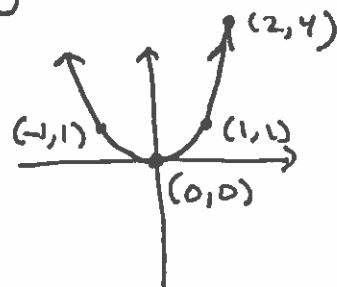
$$y = f(x) = c$$



$$y = f(x) = a \cdot x$$

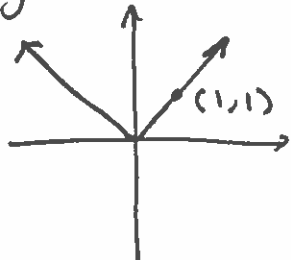


$$y = f(x) = x^2$$



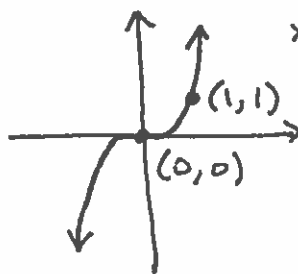
"parabola"

$$y = f(x) = |x|$$



$$y = f(x) = x^3$$

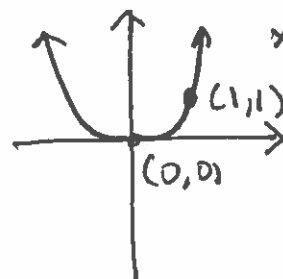
(similar to $x^5, x^7, x^9, \dots$
 x odd pos.)



"serpentine"

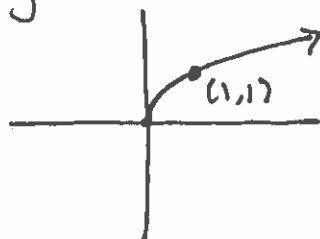
$$y = f(x) = x^4$$

(similar to $x^6, x^8, \dots$
 x even pos.)



"bucket"

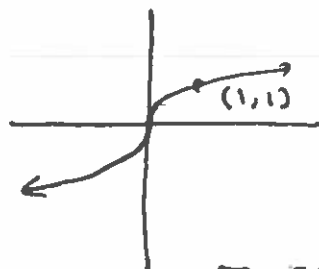
$$y = f(x) = \sqrt{x}$$



"sideways half parabola"

(similar to $\sqrt[4]{x}, \sqrt[5]{x}, \dots$)

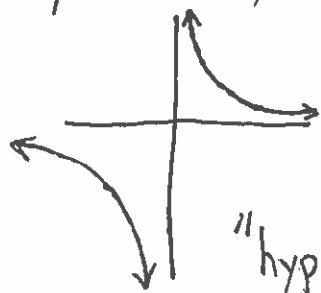
$$y = f(x) = \sqrt[3]{x}$$



(similar to $\sqrt[5]{x}, \sqrt[7]{x}, \dots$)

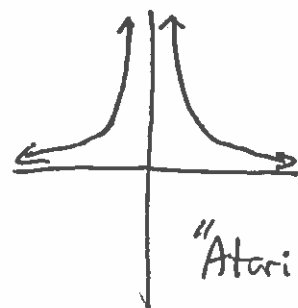
$$y = f(x) = \frac{1}{x} = x^{-1}$$

(similar to $x^{-3}, x^{-5}, \dots$)



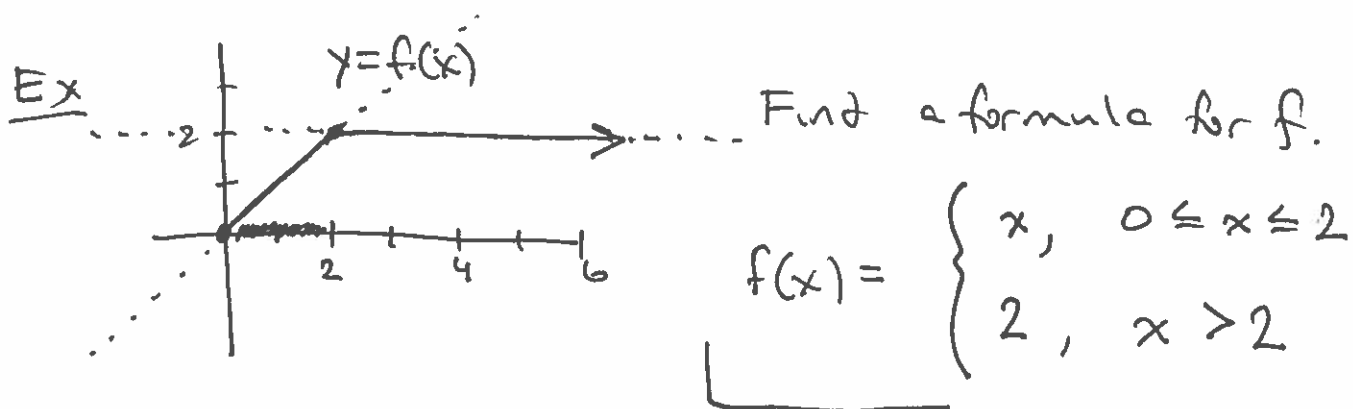
"hyperbola"

$$y = f(x) = \frac{1}{x^2} = x^{-2}$$



"Atari logo"

Piecewise-defined ~~def~~ functions



A piecewise-defined function.

$$f(0.5) = 0.5$$

↓

$$0 \leq 0.5 \leq 2 \quad \left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} x$$

✓

$$f(7) = 2$$

↓

$$7 > 2 \quad \left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} 2$$

✓

$$f(2) = 2$$

↓

$$0 \leq 2 \leq 2 \quad \left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} x$$

✓

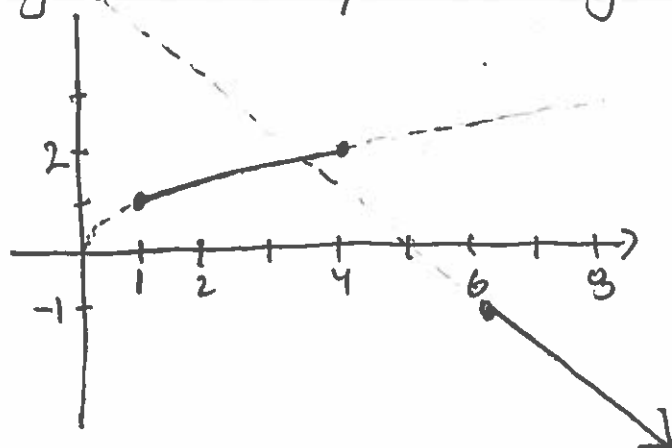
$$2 > 2 \quad \text{X}$$

Ex

$$g(x) = \begin{cases} \sqrt{x}, & 1 \leq x \leq 4 \\ 5-x, & x \geq 6 \end{cases}$$

domain of g ? $[1, 4] \cup [6, \infty)$

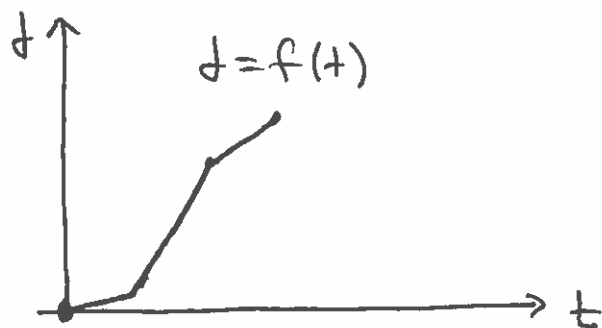
range of g ? Actually first get a graph!



So range is
 $(-\infty, -1] \cup [1, 2]$

Ex Triathlon (swim, bike, run)

Let $f(t)$ = distance traveled after t minutes.



Ex $f(x) = \begin{cases} x+2, & x < 1 \\ x+1, & 1 \leq x \leq 3 \\ 7-x, & x > 3 \end{cases} \Rightarrow \text{domain?}$

Evaluate

$$f(-2) = -2 + 2 = 0$$

$$\downarrow$$
$$-2 < 1 \checkmark$$

$$f(9) = 7 - 9 = -2$$

$$\downarrow$$
$$9 > 3 \checkmark$$

$$f(3) = 3 + 1 = 4$$

$$\downarrow$$
$$1 \leq 3 \leq 3 \checkmark$$

Solve

$$f(x) = 3 \text{ solve for } x.$$

Algebraic

$$\begin{aligned} x+2 &= 3 \\ x &= 1 \end{aligned}$$

used when $x < 1$

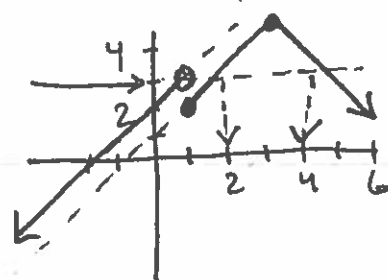
$$\begin{aligned} x+1 &= 3 \\ x &= 2 \end{aligned}$$

$1 \leq x \leq 3 \checkmark$

$$\begin{aligned} 7-x &= 3 \\ x &= 4 \end{aligned}$$

$x > 3 \checkmark$

Graphical



Ex $f(x) = \begin{cases} -\frac{1}{2}x + 1 & , x \leq 2 \\ -x^2 + 4x - 1 & , x > 2 \end{cases}$

Solve $f(x) = 2$.

$$\begin{aligned} -\frac{1}{2}x + 1 &= 2 \\ -\frac{1}{2}x &= 1 \\ x &= -2 \end{aligned}$$

used
for $x \leq 2$

$$\begin{aligned} -x^2 + 4x - 1 &= 2 \\ -x^2 + 4x - 3 &= 0 \\ x^2 - 4x + 3 &= 0 \\ (x-1)(x-3) &= 0 \\ x &= 1 \text{ or } x = 3 \end{aligned}$$

used
for $x > 2$

So $x = -2$ or $x = 3$.