PIECEMEAL GRAPHS

Piecemeal graphs can be referred to as "bits and pieces" graphs.

There are two main types of piecemeal graphs:

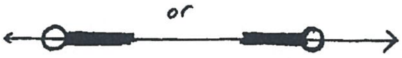
Continuous - graph has no breaks or holes.

Discontinuous - graph has at least one distinct break or hole.

When sketching be aware of open and closed end points.

closed $\geq, \leq$

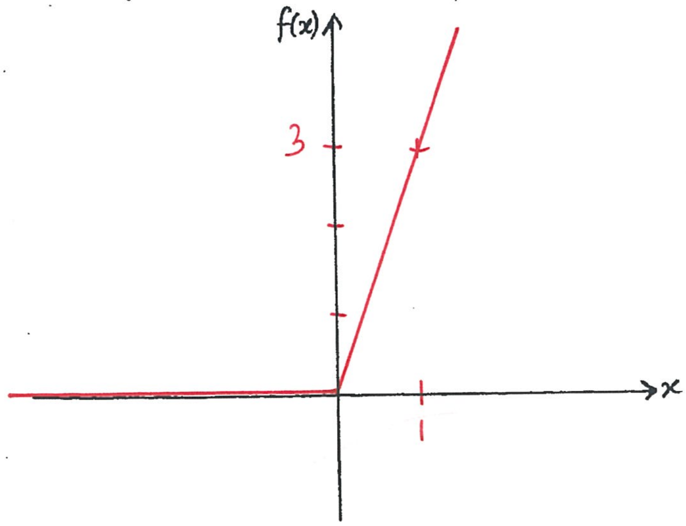
open $>, <$



Examples: CONTINUOUS

① Sketch each of the following:

a) $f(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ 3x & \text{if } x > 0 \end{cases}$

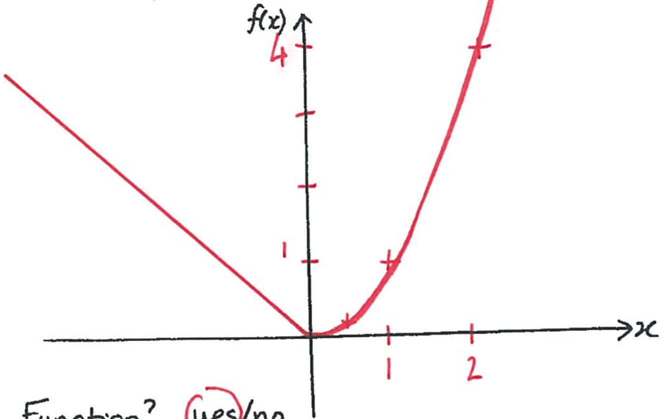


Function? yes/no

Domain: $\mathbb{R}$

Range: $\mathbb{R}^+$

b) $f(x) = \begin{cases} -x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$

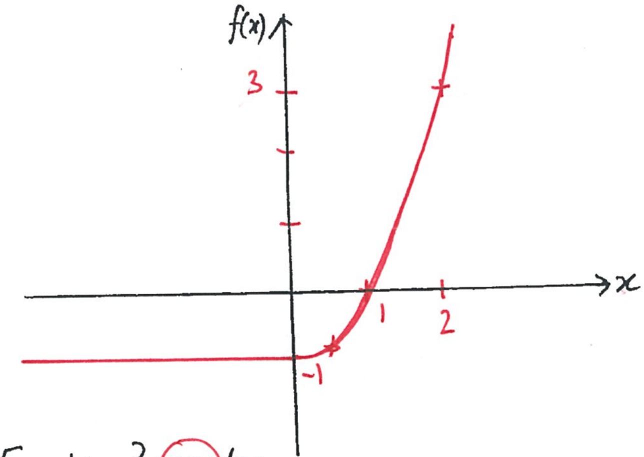


Function? yes/no

Domain: $\mathbb{R}$

Range: $\mathbb{R}^+$

c) $f(x) = \begin{cases} -1 & \text{if } x \leq 0 \\ x^2 - 1 & \text{if } x > 0 \end{cases}$

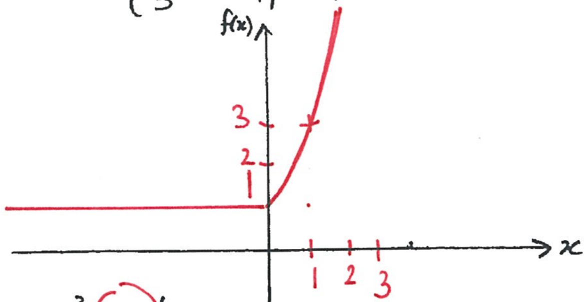


Function? yes/no

Domain: $\mathbb{R}$

Range: $[-1, +\infty)$

d) $f(x) = \begin{cases} 1 & \text{if } x \leq 0 \\ 3^x & \text{if } x > 0 \end{cases}$

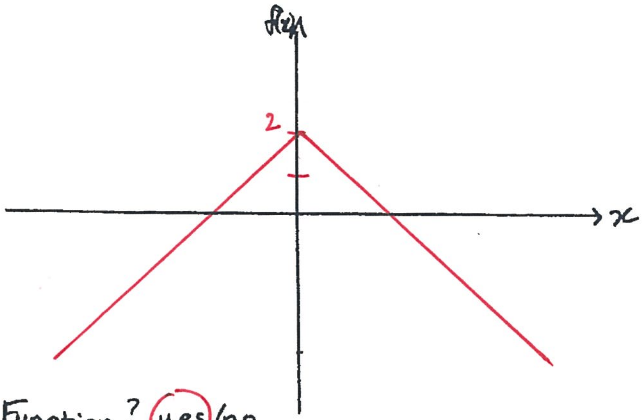


Function? yes/no

Domain: $\mathbb{R}$ Range: $[1, +\infty)$

PIECEMEAL GRAPHS

e) $f(x) = \begin{cases} x+2 & \text{if } x \leq 0 \\ 2-x & \text{if } x > 0 \end{cases}$

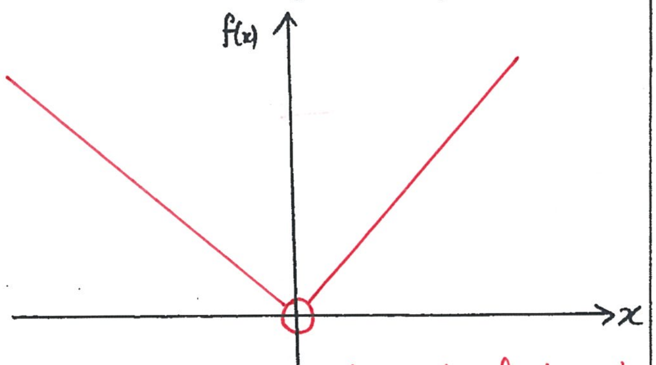


Function? yes/no

Domain: $\mathbb{R}$ Range: $(-\infty, 2]$

DISCONTINUOUS

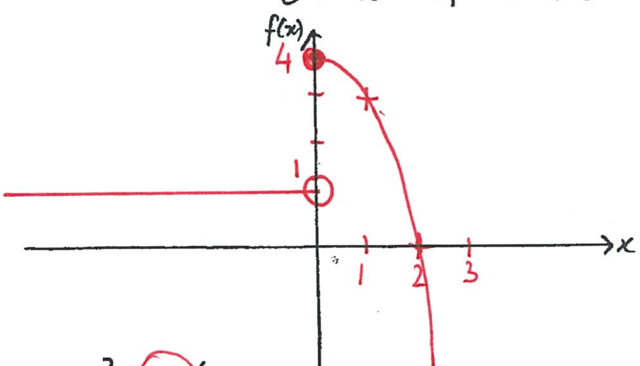
② a) $f(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x > 0 \end{cases}$



Function? yes/no on its natural domain

Domain: $\mathbb{R} - \{0\}$ Range: $\mathbb{R}^+ - \{0\}$

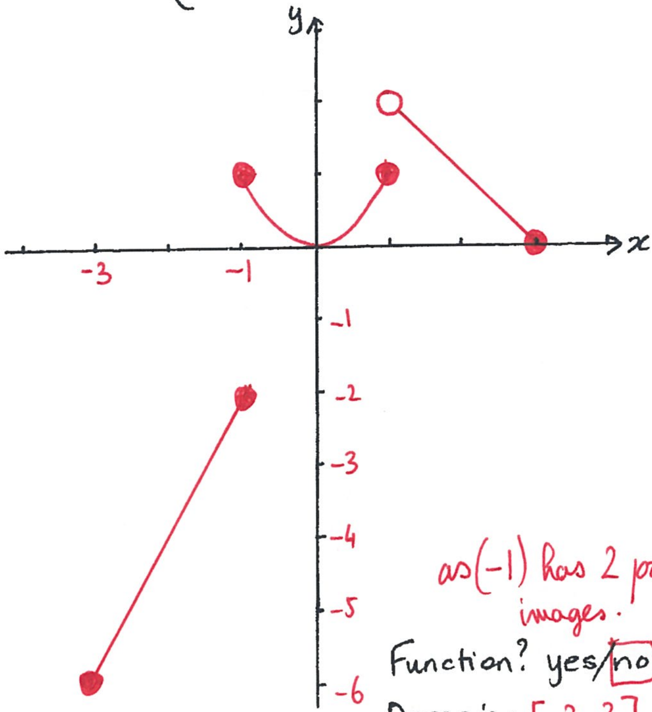
b) $f(x) = \begin{cases} 1 & \text{if } x < 0 \\ 4-x^2 & \text{if } x \geq 0 \end{cases}$



Function? yes/no

Domain: $\mathbb{R}$ Range: $(-\infty, 4]$

c) $y = \begin{cases} 2x & \text{for } -3 \leq x < -1 \\ x^2 & \text{for } -1 \leq x \leq 1 \\ 3-x & \text{for } 1 < x \leq 3 \end{cases}$



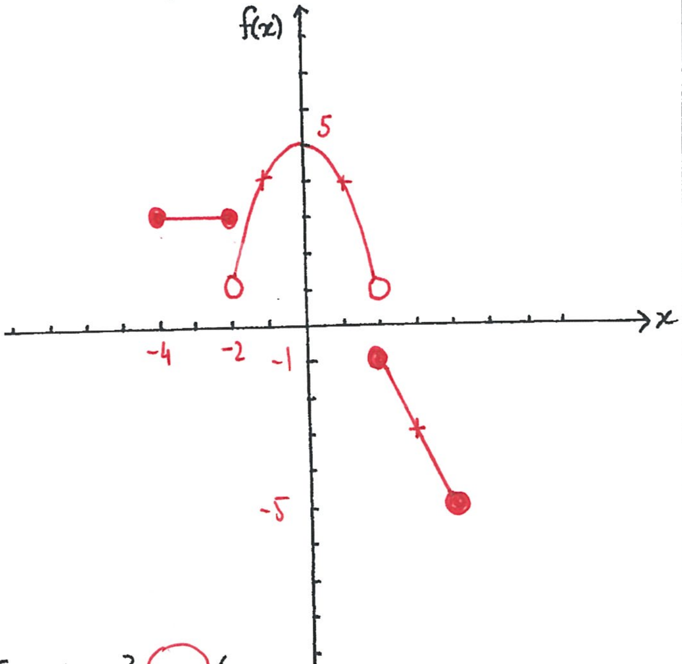
as (-1) has 2 possible images.

Function? yes/$\boxed{\text{no}}$

Domain: $[-3, 3]$

Range: $[-6, -2] \cup [0, 2)$

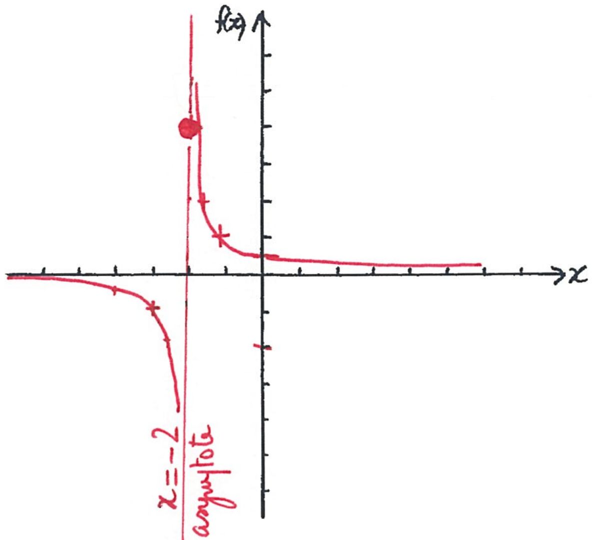
d) $f(x) = \begin{cases} 3 & -4 \leq x \leq -2 \\ 5-x^2 & -2 < x < 2 \\ 3-2x & 2 \leq x \leq 4 \end{cases}$



Function? yes/no

Domain: $[-4, 4]$ Range: $[-5, -1] \cup (-2, 5]$

e) $f(x) = \begin{cases} \dfrac{1}{x+2} & \text{for } x \neq -2 \\ 4 & \text{for } x = -2 \end{cases}$

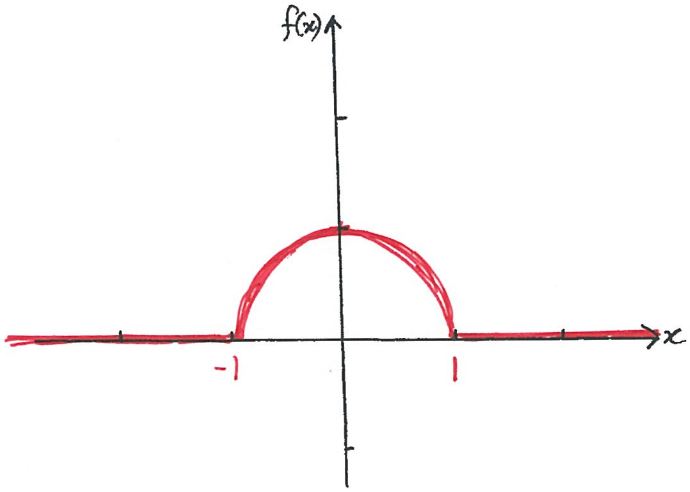


Function? yes/no

Domain: $\mathbb{R}$ Range: $\mathbb{R} - \{0\}$

One last piecemeal graph...

③ $y = \begin{cases} 0 & \text{for } x \leq -1 \\ \sqrt{1-x^2} & \text{for } -1 < x < 1 \\ 0 & \text{for } x \geq 1 \end{cases}$



Function? yes/no

Domain: $\mathbb{R}$

Range: $[0,1]$

Substitution into Piecemeal Functions/Relations.

① For $g(x) = \begin{cases} x-1 & \text{for } x < 1 \\ x^2 & \text{for } 1 \leq x \leq 3 \\ 3 & \text{for } x > 3 \end{cases}$

find:

a) $g(-2) = -2-1 = -3$

b) $g(3) = 3^2 = 9$

c) $g(4) = 3$

② For $h(x) = \begin{cases} x^3 & \text{for } x < -2 \\ (x-1)^2 & \text{for } -2 \leq x \leq 1 \\ 5-2x & \text{for } x > 1 \end{cases}$

Find:

a) $h(-3) = (-3)^3 = -27$

b) $h(-2) = (-2-1)^2 = (-3)^2 = 9$

c) $h(\frac{1}{2}) = (\frac{1}{2}-1)^2 = (-\frac{1}{2})^2 = 1/4$

d) $h(3) = 5 - 2 \times 3 = -1$

③ $f(x) = \begin{cases} \dfrac{2}{3-x} & \text{for } x \neq 3 \\ -1 & \text{for } x = 3 \end{cases}$

Find:

(a) $f(-3) = \dfrac{2}{3-(-3)} = \dfrac{2}{6} = \dfrac{1}{3}$

(b) $f(3) = -1$

(c) $f(\frac{1}{2}) = \dfrac{2}{3 - 1/2} = \dfrac{2}{5/2} = \dfrac{4}{5}$