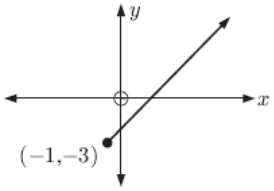
C DOMAIN AND RANGE

The **domain** of a relation is the set of values of x in the relation.
The **range** of a relation is the set of values of y in the relation.

The domain and range of a relation are often described using **set notation**.

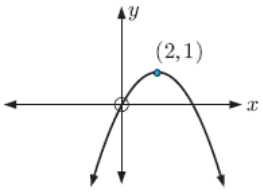
For example:

(1)



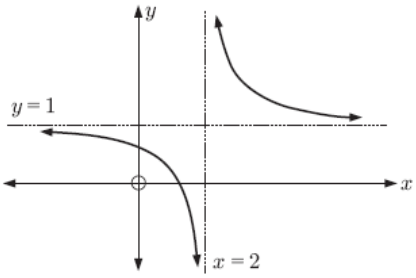
All values of $x \geqslant -1$ are included,
so the domain is $\{x \mid x \geqslant -1\}$.
All values of $y \geqslant -3$ are included,
so the range is $\{y \mid y \geqslant -3\}$.

(2)



x can take any value,
so the domain is $\{x \mid x \in \mathbb{R}\}$.
y cannot be > 1,
so the range is $\{y \mid y \leqslant 1\}$.

(3)



x can take all values except 2,
so the domain is $\{x \mid x \neq 2\}$.
y can take all values except 1,
so the range is $\{y \mid y \neq 1\}$.

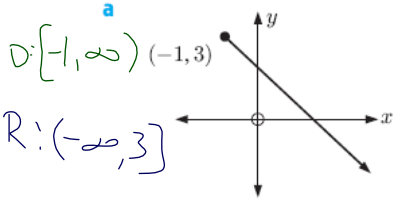
$(-\infty, 2) \cup (2, \infty)$

$D: x \neq 2$

$R: y \neq -1$

1 For each of the following graphs, find the domain and range:

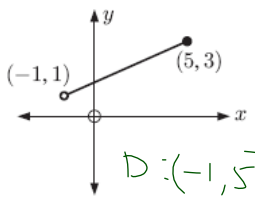
a



$D: [-1, \infty)$

$R: (-\infty, 3]$

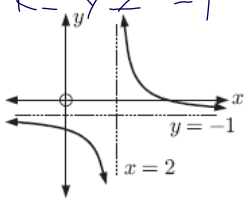
b



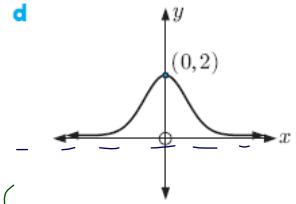
$D: (-1, 5]$

$R: (1, 3]$

c



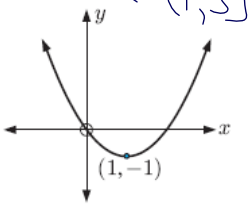
d



$D: (-\infty, \infty)$

$R: (0, 2]$

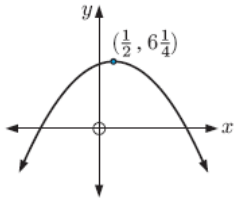
e



$D: \mathbb{R}$

$R: [-1, \infty)$

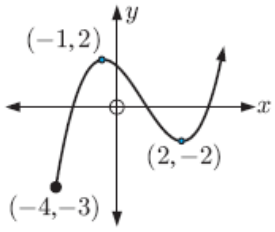
f



$D: \mathbb{R}$

$R: (-\infty, 6\frac{1}{4}]$

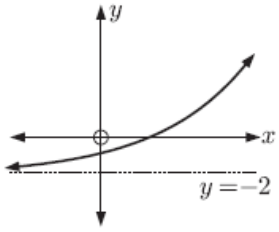
g



D: $[-4, \infty)$

R: $[-3, \infty)$

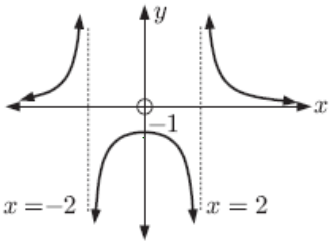
h



D: $\mathbb{R}$

R: $(-2, \infty)$

i



D: $x \neq -2, 2$

R: $(-\infty, -1] \cup (0, \infty)$

2 Use technology to help sketch graphs of the following functions. Find the domain and range of each.

a $f(x) = 2x + 4$

D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

b $f(x) = x^2 - 4x + 7$

D: $(-\infty, \infty)$

R: $[3, \infty)$

c $y = (x - 3)(x + 1)$

D: $(-\infty, \infty)$

R: $[-4, \infty)$

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

D: $[0, \infty)$

R: $[0, \infty)$

e $y = 5x - 3x^2$

D: $(-\infty, \infty)$

R: $(-\infty, 2]$

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

inverse square

D: $x \neq 0$

R: $(0, \infty)$

g $f(x) = (x + 3)^4 - 1$

D: $(-\infty, \infty)$

R: $[-1, \infty)$

h $f(x) = \sqrt{x^2 + 4}$

D: $(-\infty, \infty)$

R: $[2, \infty)$

i $f(x) = \sqrt{4 - x^2}$

D: $[-2, 2]$

R: $[0, 2]$

j $f(x) = x + \frac{1}{x}$

D: $x \neq 0$

R:

k $y = \frac{x + 4}{x - 2}$

D: $x \neq 2$

R:

l $y = x^3 - 3x^2 - 9x + 10$

D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

m $y = x^2 + x^{-2}$

$y = x^2 + \frac{1}{x^2}$

D: $x \neq 0$

R: $[2, \infty)$

n $y = x^3 + \frac{1}{x^3}$

D: $x \neq 0$

R: $(-\infty, -2] \cup [2, \infty)$

o $f(x) = x^4 + 4x^3 - 16x + 3$

D: $(-\infty, \infty)$

R: $[-5, \infty)$