

9 Parametric and vector functions — Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
parametric function	参数方程	_____
vector	向量	_____

Recall

So far a function gave one output for each input, like $y = f(x)$:

- But a moving object needs both its across (x) and up (y) positions.
- Both can be given in terms of time.

This sheet introduces parametric and vector functions. Each idea has a worked example.

New ideas

■ 1 Parametric functions

A **parametric function** 参数方程 gives both coordinates in terms of a third variable (a **parameter**), usually time t : $(x(t), y(t))$. As t runs, the point traces a path.

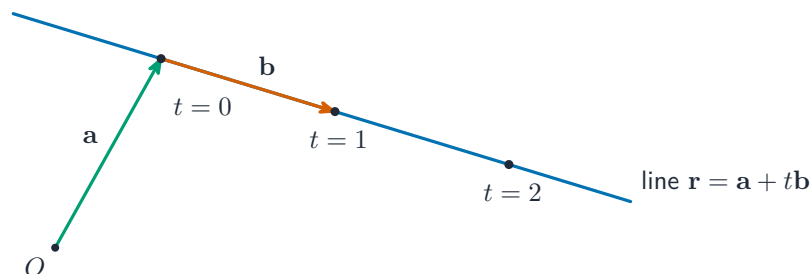
Worked example. $x(t) = t$, $y(t) = t^2$: at $t = 0$ the point is $(0, 0)$; at $t = 1$, $(1, 1)$; at $t = 2$, $(2, 4)$ – tracing a parabola.

■ 2 Direction of travel

Because t is like time, the path has a **direction** – the order in which it is drawn as t increases.

■ 3 Vectors

A **vector** 向量 has magnitude and direction, written by components $\langle a, b \rangle$. A **vector-valued function** packages a moving point as $\vec{r}(t) = \langle x(t), y(t) \rangle$.



■ 4 Same idea, two forms

A parametric function and a vector-valued function carry the **same** information – the position of a moving point at each time t .

Watch out: in a parametric curve, y is **not** given directly in terms of x – both are given in terms of t . To find the ordinary y -vs- x shape you eliminate t .

Practice

Try these in order. The methods are all above.

2.1 State what a parametric function gives you. [2]

2.2 For $x(t) = t$, $y(t) = t^2$, find the point when $t = 3$. [2]

2.3 For $x(t) = 2t$, $y(t) = t + 1$, find the point when $t = 0$ and when $t = 2$. [2]

2.4 State the two things a vector has. [2]

2.5 State what a parametric and a vector-valued function have in common. [1]
