

# Parametric equations example problems\*

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## 1 Parametric equations

### 1.1 Creating curves

**Problem 1.1.1.** Graph the plane curve defined by the parametric equations  $x = 5 - t^2$  and  $y = \frac{t}{2}$  for  $t \in [0, 4]$ .

**Problem 1.1.2.** Graph the plane curve defined by the parametric equations  $x = 3 \cos t$  and  $y = 3 \sin t$  for  $t \in [0, \pi]$ .

**Problem 1.1.3.** Graph the plane curve defined by the parametric equations  $x = -2 + 3t$  and  $y = -3 + 5t$  for  $t \in [0, 3]$ .

**Problem 1.1.4.** Graph the plane curve defined by the parametric equations  $x = t^2 - 3$  and  $y = t^3 - t$  for  $t \in [-2, 2]$ .

**Problem 1.1.5.** Graph the plane curve defined by the parametric equations  $x = t^3 - t$  and  $y = t^4 - 2t^2 + 2$  for  $t \in [-2, 2]$ .

**Problem 1.1.6.** Graph the plane curve defined by the parametric equations  $x = 3 \cos 2t + \sin 5t$  and  $y = 3 \sin 2t + \cos 5t$  for  $t \in [-4, 4]$ .

**Problem 1.1.7.** Graph the plane curve defined by the parametric equations  $x = \cos 2t$  and  $y = \sin kt$  for  $k = \{1, 2, 3, 4, 5, 6, 7, 8\}$  and  $t \in [0, 2\pi]$  and describe the effect that  $k$  has.

**Problem 1.1.8.** Graph the plane curve defined by the parametric equations  $x = \cosh t$  and  $y = \sinh t$  and use the identity  $\cosh^2 t - \sinh^2 t = 1$  to find an equation for the graph. Explain where the hyperbolic in  $\sinh$  and  $\cosh$  comes from.

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\*Vector Calculus

## 1.2 Parameterization of a curve

**Problem 1.2.1.** *Parameterize the function  $f(x) = x^2$  from the point  $(1, 1)$  to the point  $(3, 9)$ .*

**Problem 1.2.2.** *Find the parametric equations for the line segment from  $(4, -2)$  to  $(2, -1)$ .*

**Problem 1.2.3.** *Find the parametric equations for the parabola  $y = 2 - x^2$  from  $(2, -2)$  to  $(0, 2)$ .*

**Problem 1.2.4.** *Find the points of intersection for the two curves given by the parametric equations  $x = t + 3$ ,  $y = t^2$  and  $x = 1 + s$ ,  $y = 2 - s$ .*