

# W13 - Homework

## Stepwise problems - Thu. 11:59pm

### Parametric curves

01

#### ✍ Convert parametric curve to function graph

Write the following curves as the graphs of a function  $y = f(x)$ . (Find  $f(x)$  for each case.)

(a)  $x = t + 3$ ,  $y = 4t$  and  $0 < t < 1$

(b)  $x = \cos t$ ,  $y = \sin^2 t$  and  $0 < t < 2\pi$

Sketch each curve.

### Calculus with parametric curves

02

#### ✍ Parametric curves: Points with given slope

Where on the image of  $(3t^2 - 2t, t^3 - 6t)$  does the tangent line have slope 3?

03

#### ✍ Parametric concavity

Find  $\frac{d^2y}{dx^2}$  at  $t = 1$  for the curve given parametrically by  $x = 4 - t^{-2}$ ,  $y = t^{-1} + t$ .

## Regular problems - Sat. 11:59pm

### Parametric curves

04

#### ✍ Convert parametric curve to function graph

Write the following curves as the graphs of a function  $y = f(x)$ . (Find  $f(x)$  for each case.)

(a)  $x = t$ ,  $y = t$  and  $-\infty < t < \infty$

(b)  $x = e^t$ ,  $y = e^t$  and  $-\infty < t < \infty$

Sketch each curve.

05

**✍ Convert function graph to parametric curve**

Find parametric curves  $c(t) = (x(t), y(t))$  whose images are the following graphs:

(a)  $y = 3x - 4$  and  $c(0) = (2, 2)$

(b)  $y = 3x - 4$  and  $c(3) = (2, 2)$

## Calculus with parametric curves

06

**✍ Parametric concavity**

Find the intervals of  $t$  on which the parametric curve  $c(t) = (t^2, t^3 - 4t)$  is concave up.

07

**✍ Parametric arclength**

Find the arclength of the curve given parametrically by  $x = 2t^2$ ,  $y = 3t^2 - 1$  over the time interval  $0 \leq t \leq 4$ .

08

**✍ Minimum speed of a particle**

Suppose a travelling particle has position modelled by the parametric curve:

$$c(t) = (t^3 - 4t, t^2 + 1)$$

What is the *slowest speed* of the particle?

09

**✍ Cycloid - Arclength and surface area of revolution**

Consider the cycloid given parametrically by  $c(t) = (t - \sin t, 1 - \cos t)$ .

(a) Find the length of one arch of the cycloid.

(b) Suppose one arch of the cycloid is revolved around the  $x$ -axis. Find the area of this surface of revolution.

