

## Worksheet for 2021-08-27

## Conceptual questions

**Question 1.** Draw the parametric curve  $x = e^t, y = e^{2t}$ . (When not stated, you should assume that the  $t$  interval is the largest possible, in this case from  $-\infty$  to  $\infty$ .)

**Question 2.** If  $x = f(t), y = g(t)$  is some parametric curve, how does  $x = f(3t), y = g(3t)$  compare?

**Question 3.** Let  $C$  be the shape described by the equation  $x^2 + y^2 = 5$ . (What is this shape?) If we take  $C$  and

- (1) shift it by 2 units in the positive  $y$  direction (i.e. upwards),
- (2) and then stretch it by a factor of 3 in the  $x$  direction (i.e. horizontally),

what Cartesian equation describes the resulting shape?

**Question 4.** Come up with a parametrization  $x = f(t), y = g(t)$  for the starting shape  $C$  in the preceding problem, and then a parametrization for the shape obtained after applying the transformations.

**Question 5.** Suppose a parametrization  $x = f(t), y = g(t), a \leq t \leq b$  traces out a circle exactly once counter-clockwise, ending where it started. One of the expressions  $\int_a^b f(t)g'(t) dt$  and  $\int_a^b g(t)f'(t) dt$  computes the area enclosed by the circle, and the other is its negative. Figure out which is which.