

## Worksheet 10 - Line Integrals

### 1. Finding the surface area of a fence.

Imagine that you need to find the surface area of a fence on the edge of your property. Suppose that the edge of your property is a circle of radius 2 and suppose also that the height of your fence is given by  $f(x, y) = 7 - x$  because you prefer the view to the right.

- Parametrize the curve representing the edge of your property (that is,  $c(t) = \langle ? , ? \rangle$ ).
- Parametrize  $f$ .
- Find "speed,"  $\|c'(t)\|$ .
- What is the surface area of the fence?

### 2. Finding length with line integrals.

What is the length of your fence in problem 1? Calculate using two different parameterizations for  $c$ .

3. Computing a scalar line integral along a piecewise path.

Let  $f(x, y) = y - x$ . Suppose this is the density along a wire. Let  $c$  be the path linking a vector from the origin to the point  $(2, 1)$  and another vector from  $(2, 1)$  to the point  $(4, -7)$ .

- (a) Parametrize  $c$ .
- (b) Parametrize  $f$ .
- (c) Find speed,  $\|c'(t)\|$ .
- (d) Evaluate the scalar integral to find the mass of the wire.

4. Calculating the average temperature on a path.

Suppose  $f(x, y)$  from problem 3 is instead the temperature along the path  $c$ . Divide your answer to problem 3 by the length of the path to find the average temperature on that path.