

Lecture 27: Fundamental theorem of line integrals

1 What is the line integral of

$$\vec{F}(x, y) = [\cos^{2019}(x + y), \cos^{2019}(x + y) + x]$$

along the unit circle parametrized counter clockwise.

2 Find the line integral of

$$\vec{F} = [\sin(x) - y, y^7 + 5]$$

along the path $\vec{r}(t) = [t, \sin(2t)]$ from $t = 0$ to $t = \pi$.

Remember that a vector field is a **gradient field** if $\vec{F} = \nabla f$. There are equivalent notions which are all called **conservative** F is a **gradient field**, F has the **closed loop property** or F is **path independent**. If a vector field is defined everywhere in the plane, then $\text{curl}(F) = Q_x - P_y = 0$ is equivalent too as we will see later.

- 3 Quantitatively decide which of the following vector fields are conservative.

