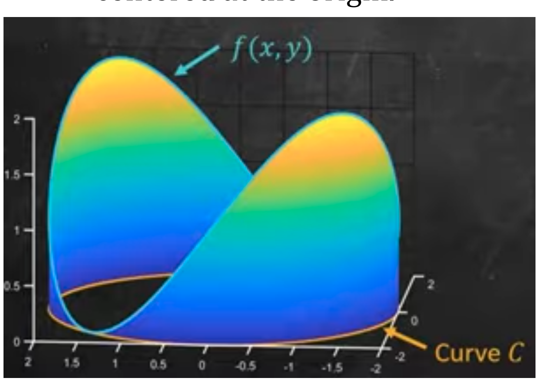
Line Integrals
Multivariable Calculus

https://www.youtube.com/watch?v=WA5_a3C2iqY&list=PLHXZ9OQGMqxfW0GMqeUE1bLKaYor6kbHa&index=3&t=612s

$$\int_C f(x,y)\,ds = \int_a^b f(h(t),g(t))\sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$$

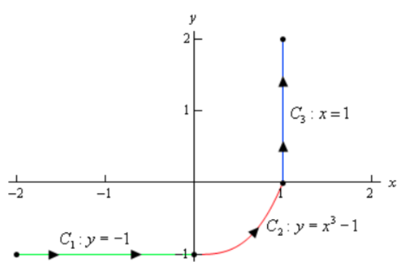
Curve	**Parametric Equations**	
$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (Ellipse)	Counter-Clockwise $x=a\cos(t)$ $y=b\sin(t)$ $0\le t\le 2\pi$	Clockwise $x=a\cos(t)$ $y=-b\sin(t)$ $0\le t\le 2\pi$
$x^2+y^2=r^2$ (Circle)	Counter-Clockwise $x=r\cos(t)$ $y=r\sin(t)$ $0\le t\le 2\pi$	Clockwise $x=r\cos(t)$ $y=-r\sin(t)$ $0\le t\le 2\pi$
$y=f(x)$	$x=t$ $y=f(t)$	
$x=g(y)$	$x=g(t)$ $y=t$	
Line Segment From (x_0,y_0,z_0) to (x_1,y_1,z_1)	$\vec{r}(t)=(1-t)\langle x_0,y_0,z_0\rangle+t\langle x_1,y_1,z_1\rangle\ ,\ 0\le t\le 1$ or $x=(1-t)x_0+t\,x_1$ $y=(1-t)y_0+t\,y_1\quad ,\quad 0\le t\le 1$ $z=(1-t)z_0+t\,z_1$	

1. Calculate the line integral of $f(x,y)=\frac{x^2+y^2}{4}+\frac{xy}{2}$ above the circle of radius 2 centered at the origin.



2. Evaluate $\int_C xy^4 \, ds$ where C is the right half of the circle $x^2 + y^2 = 16$ traced out in a counter-clockwise direction.

3. Evaluate $\int_C 4x^3 \, ds$ where C is the curve shown below.



4. Evaluate $\int_C 4x^3 ds$ where C is the line segment from $(-2, -1)$ to $(1, 2)$

5. Evaluate $\int_C 4x^3 ds$ where C is the line segment from $(1, 2)$ to $(-2, -1)$