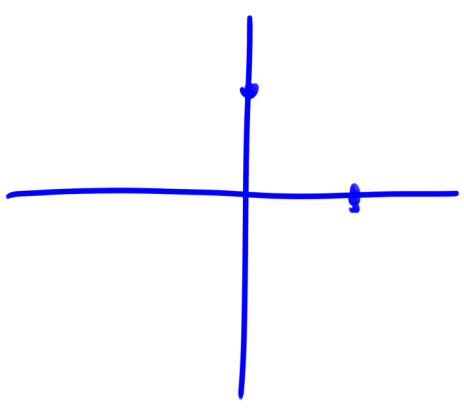
10.1.4

$F = [xy, x^2 y^2]$

(2, 0)

straight to

(0, 2)



$y = mx + b$

$= -x + 2$

$t = -2x$

$\frac{-t}{2} = x$

$y - 2 = -x$

$2 - y = x$

$t = -2(2 - y)$

$= -4 + 2y$

$t + 4 = 2y$

$\frac{t+4}{2} = y$

if $t = -4$

$x = \frac{-t}{2} = \frac{4}{2} = 2 = x$ ✓

$y = \frac{t+4}{2} = \frac{-4+4}{2} = 0 = y$ ✓

if $t = 0$

$x = \frac{-t}{2} = \frac{0}{2} = 0 = x$ ✓

$y = \frac{t+4}{2} = \frac{0+4}{2} = 2$ ✓

$$\int_C F(r)\,dr = \int_{-4}^{0} F(r(t) \cdot \frac{dr}{dt}\,dt$$

$$r(t) = \begin{bmatrix} -t/2 \\ \frac{t+4}{2} \end{bmatrix} \qquad \frac{dr}{dt} = \begin{bmatrix} -1/2 \\ 1/2 \end{bmatrix}$$

$$F(r(t)) = \begin{bmatrix} (-t/2)\left(\frac{t+4}{2}\right) \\ (-t/2)^2 \left(\frac{t+4}{2}\right)^2 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{1}{4}(-t^2 - 4t) \\ \frac{1}{16}(t^2(t^2 + 8t + 16)) \end{bmatrix}$$

$$= \begin{bmatrix} -t^2/4 - t \\ t^4/16 + \frac{t^3}{2} + t^2 \end{bmatrix}$$

$$F(r(t)) \cdot \frac{dr}{dt}$$

$$= t^2/8 + t/2 + \frac{t^4}{32} + t^3/4 + \frac{t^2}{2}$$

$$= \frac{t^4}{32} + \frac{t^3}{4} + \frac{5t^2}{8} + \frac{t}{2}$$

$$\int_{-4}^{0} F(r(t)) \cdot \frac{dr}{dt}\,dt$$

$$= \int_{-4}^{0} \frac{t^4}{32} + \frac{t^3}{4} + \frac{5t^2}{8} + \frac{t}{2}\,dt$$

$$= \frac{t^5}{5(32)} + \frac{t^4}{16} + \frac{5t^3}{3(8)} + \frac{t^2}{4}\Big|_{-4}^{0}$$

$$= -\left(-6.4 + 16 - 2.67 + 4\right)$$

$$= -10.93$$