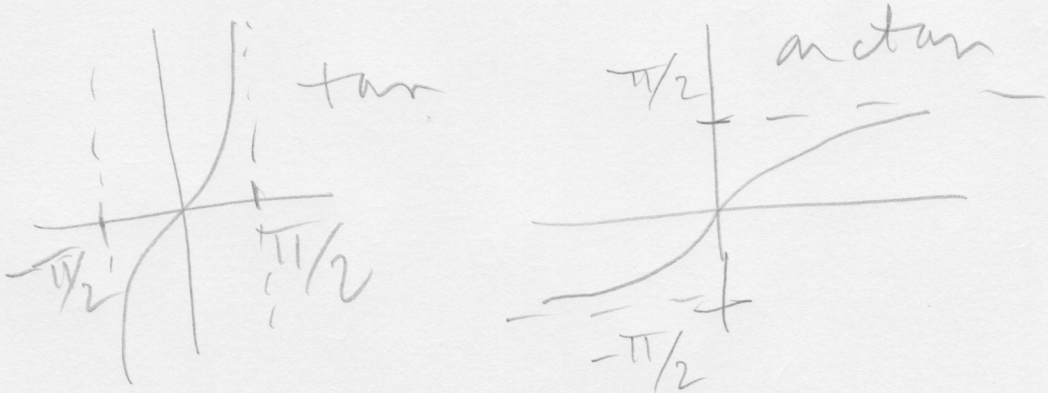
(4c) $\varphi = \arctan\left(\frac{y}{x}\right)$, $\nabla\varphi = F$

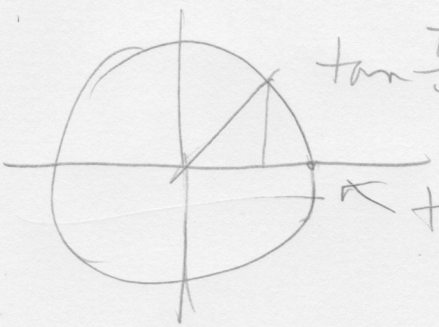
é conservativo!

$$\int_{\alpha} F \cdot d\alpha = \varphi(B) - \varphi(A)$$

$A = \alpha(a) = \alpha(0) = (1,0)$, $B = \alpha(b) = \alpha(1) = (1,1)$

$$\varphi(1,0) = \arctan\left(\frac{0}{1}\right) = \arctan(0) = 0$$





$\tan\frac{\pi}{4} = 1$; $\arctan(1) = \frac{\pi}{4}$

$\tan 0 = 0$; $\arctan 0 = 0$

$$\varphi(B) = \varphi(1,1) = \arctan(1) = \frac{\pi}{4}$$

$$\varphi(B) - \varphi(A) = \frac{\pi}{4} - 0 = \boxed{\frac{\pi}{4}}.$$