Electric Potential of a Charged Plane Sheet

Consider an infinite plane sheet perpendicular to the x-axis at $x = 0$.
The sheet is uniformly charged with charge per unit area σ.

- Electric field (magnitude): $E = 2\pi k|\sigma| = \dfrac{|\sigma|}{2\epsilon_0}$
- Direction: away from (toward) the sheet if $\sigma > 0$ $(\sigma < 0)$.
- Electric field (x-component):
  $E_x = \pm 2\pi k\sigma$.
- Electric potential:
  $V = -\displaystyle\int_0^x E_x dx = \mp 2\pi k\sigma x$.
- Here we have used $x_0 = 0$
  as the reference coordinate.