In the last lecture, we saw a potential based on distance to a fixed point

$$\phi(x) = c\,\|x - x_0\|$$

distance to x_0

constant - eg g

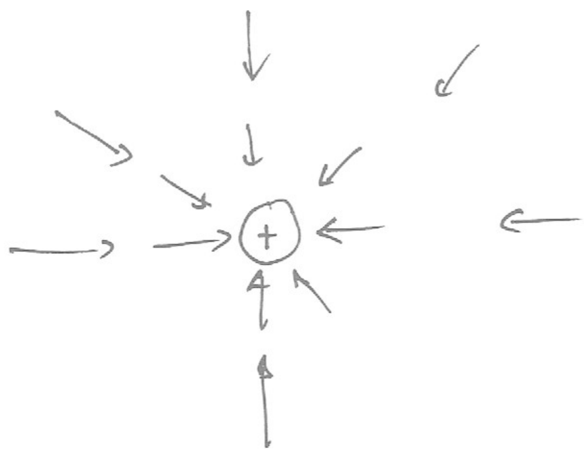
which models gravity <u>on everyday life</u>.

<u>Notice</u>:

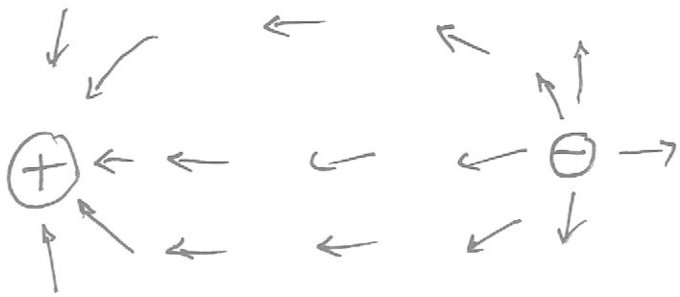
- can use this to <u>shape</u> "flow" of particles.
- this potential is attractive
- <u>repulsive</u>:

$$\phi_r = -c\,\|x - x_0\|$$

One can sketch gradient fields, ②
which superimpose



etc for one



two

These pix should look familiar

we can build attractors / repellors of more complex shape

Q: <u>complete distance</u> ?

A: Should not be expensive.

line segments] are good.
points

Line segment

$$\phi_L(x) = c \cdot g(\text{min dist } x \to \ell)$$

min dist $x \to \ell$?

<u>line</u> $p_0 + t v_0$

<u>point</u> x

closest point is ~~q~~ q (unknown)

$(x-q) \perp v_0$ so

$$x \cdot v_0 = q \cdot v_0$$

so $x \cdot v_0 = (p_0 + t_q v_0) \cdot v_0$

so $t_q = \dfrac{(x_0 \cdot v_0 - p_0 \cdot v_0)}{(v_0 \cdot v_0)}$

if $t_q \in [0,1]$ OK

else $t_q < 0 \Rightarrow t_q = 0$

$t_q > 1 \Rightarrow t_q = 1$