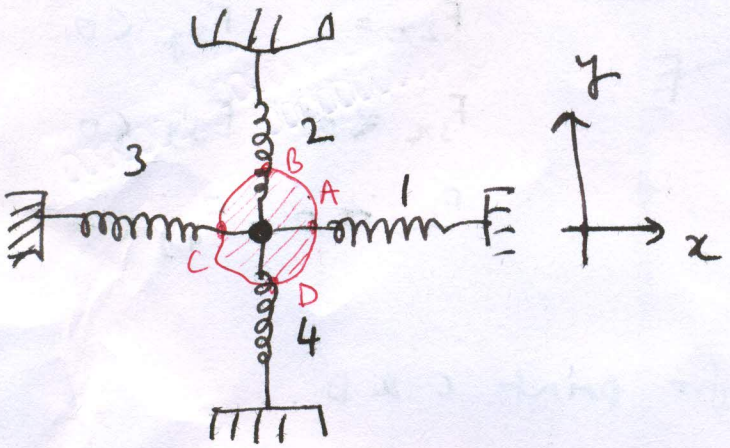
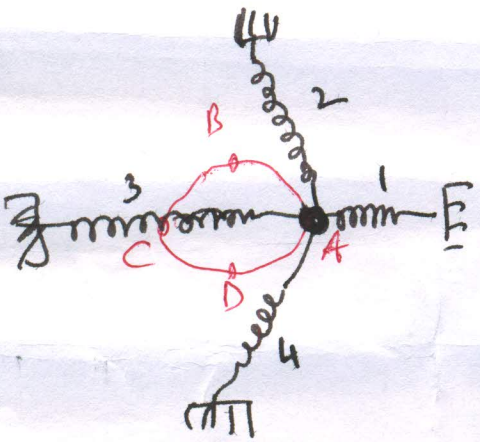
Consider a particle held in place by a set of springs as shown.



Pt. of equilibrium is at origin and the total force acting on the particle is zero.

Now consider a small volume (shown in red) and A, B, C, D are four representative points on the surface as shown. To do this we need to physically place the particle at those points, to evaluate $\int F.ds$.



At position A.

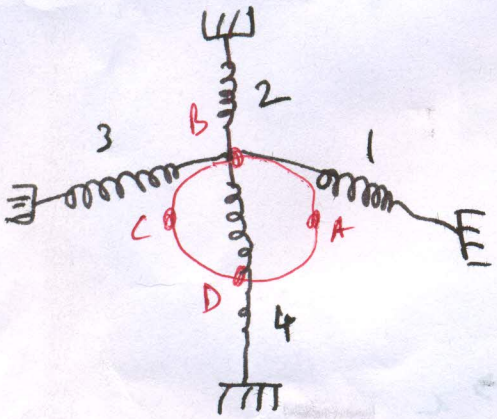
$F_{1x} < 0$ $\quad F_{1y} = 0$

$F_{2x} < 0$ $\quad F_{2y} > 0$

$F_{3x} < 0$ $\quad F_{3y} = 0$

$F_{4x} < 0$ $\quad F_{4y} > 0$

→ will cancel.



At point B

$F_{1x} > 0$ $F_{1y} < 0$

$F_{2x} = 0$ $F_{2y} < 0$

$F_{3x} < 0$ $F_{3y} < 0$

$F_{4x} \leq 0$ $F_{4y} < 0$

Do the same for point C & D.

Taken together ~~you~~ we can see that in each case

$$F \cdot ds < 0$$

So the integral of $\int F \cdot ds$ will also be less than zero as required by the stability condition.