The distributive property would be:

$$(x_1-y_1)\left[(x_2-y_2)+(x_3-y_3)\right]=(x_1-y_1)(x_2-y_2)+(x_1-y_1)(x_3-y_3)$$

In order to prove this formula we use this:

$(a,b)+(c,d)=(a+c,b+d)$

$(a,b)\cdot(c,d)=(ac+bd, ad+bc)$

So the proof would be

$$(x_1,y_1)\cdot(x_2,y_2+x_3,y_3)=(x_1,y_1)\cdot(x_2+x_3,y_2+y_3)=$$
$$=(x_1\cdot(x_2+x_3)+y_1\cdot(y_2+y_3), x_1\cdot(y_2+y_3)+y_1(x_2+x_3))=$$
$$=(x_1x_2+x_1x_3+y_1y_2+y_1y_3),(x_1y_2+x_1y_3+y_1x_2+y_1x_3).$$

$$(x_1,y_1)\cdot(x_2,y_2)+(x_1,y_1)\cdot(x_3,y_3)=$$
$$=(x_1x_2+y_1y_2, x_1y_2+y_1x_2)+(x_1x_3+y_1y_3; x_1y_3+y_1x_3)=$$
$$=(x_1x_2+y_1y_2+x_1x_3+y_1y_3, x_1y_2+y_1x_2+x_1y_3+y_1x_3)$$

D) In $\mathbb{Q}^{\geq 0}$ (n,m) is $\frac{n}{m}$, also in $\mathbb{Q}$ (n,m) is $n-m$. This is derived from the lecture notes.

We order $\mathbb{Q}^{\geq 0}$ by $(n_1,m_1)<(n_2,m_2)$, this is olny true if $n_1m_2<n_2m_1$ is true

We were given the example $((1,2),(0,1))$ which is equal to $\frac{1}{2}$ or simplified $\frac{1}{2}-\frac{0}{1}=\frac{1}{2}$

So if we take the proposition from earlier

$(n_1,m_1)<(n_2,m_2)$ when $n_1m_2<n_2m_1$

And we also count in that every n/m has a set of coordinates.