R5 1 wrt $\times$ (identity for $\times$)

For this to be true, there must be some $(b,a) \in F$ s.t. $(b,a)\times(d,c) = (d,c) = (d,c)\times(b,a)$

$(1,1)$ is that element, since

$$(1,1)\times(d,c) = (1d, 1c) \quad \text{(by dfn of } \times \text{ in } D\text{)}$$

$$= (d,c) \quad \text{(D is the integral domain with 1, so 1 is in D, and is the multi. identity in D)}$$

$$= (d1, c1) \quad \text{(D is commutative)}$$

so, $(d,c)\times(1,1) = (d,c)$

R6 inverses wrt $\times$

take $(b,a), (d,c) \in F$

s.t $(b,a)\times(d,c) = e = (1,1)$

$(bd, ac) = (1,1)$

$$\left.\begin{array}{l} bd = 1 \\ ac = 1 \\ \text{so } bd = ac \end{array}\right\} \text{multiplication in D}$$

suppose $b = -c$

$d = -a$

then $(-c,a)\times(-a,c) = (ac, ac)$ dfn of $\times$ in F

we require equiv rel. dfn for $\tilde{D}$

$(ac,ac) \sim (1,1) \iff ac \times 1 = ac \times 1$

which is true, so $(ac,ac)\sim(1,1)$

and $(b,a) = (-c,-d)$

so, we have inverses in $(F,\times)$