CS727: Convex Analysis	**Scribe:** Tien-Lung Fu
Title: hw2	

0.1 Exercise 1.2.15

First, we want to prove $ri(C \times D) \subseteq riC \times riD$

$$Let\ x = (c,d) \in ri(C \bigtimes D)$$
$$we\ have\ \forall y = (\bar{c}, \bar{d}) \in C \bigtimes D, \exists \epsilon > 0\ s.t.\ x + \epsilon(x - y) \in C \bigtimes D\ (Collollary\ 1.2.5\ c)$$
$$(c,d) + \epsilon((c,d) - (\bar{c}, \bar{d})) \in C \bigtimes D$$
$$we\ have\ c + \epsilon(c - \bar{c}) \in C\ and\ d + \epsilon(d - \bar{d}) \in D$$
$$then\ we\ have\ c \in riC,\ d \in riD\ (Collollary\ 1.2.5\ a)$$
$$and\ then\ (c,d) \subseteq riC \bigtimes riD.\ (Q.E.D)$$

Second, we want to prove $riC \times riD \subseteq ri(C \times D)$

$$Let\ x = (c,d) \in riC \bigtimes riD,\ then\ c \in riC,\ d \in riD$$
$$\exists \epsilon > 0,\ \forall \bar{c} \in C, s.t.\ c + \epsilon(c - \bar{c}) \in C\ and\ \exists \epsilon > 0,\ \forall \bar{d} \in D, s.t.\ d + \epsilon(d - \bar{d}) \in D\ (Collollary\ 1.2.5\ c)$$
$$implying$$
$$\forall y = (\bar{c}, \bar{d}), \exists \epsilon > 0\ s.t.\ x + \epsilon(x - y) \in C \bigtimes D$$
$$therefore,\ x \in ri(C \bigtimes D)\ (Collollary\ 1.2.5\ a)\ (Q.E.D)$$

0.2 Exercise 1.2.18

$$Let\ C_n = [\frac{-1}{n^2}, 1],\ then\ riC_n = (\frac{-1}{n^2}, 1),\ then\ \bigcap_{n=1}^{\infty} riC_n = [0,1)$$
$$also,\ we\ have\ \bigcap_{n=1}^{\infty} C_n = [0,1],\ then\ ri \bigcap_{n=1}^{\infty} C_n = (0,1)$$
$$\bigcap_{n=1}^{\infty} riC_n \neq ri \bigcap_{n=1}^{\infty} C_n$$

0.3 Exercise 1.2.20

$$Since\ C\ is\ subset\ of\ R^n,\ we\ have\ riclC = riC\ (Proposition\ 1.2.6)$$
$$Since\ clC\ is\ affine,\ we\ have\ riclC = clC$$
$$Hence,\ we\ have\ clC = riC$$
$$Originally,\ we\ have\ riC \subseteq C \subseteq clC$$
$$Hence,\ we\ have\ C = clC$$
$$Since\ clC\ is\ affine,\ C\ is\ also\ affine$$