Q3 $V(X) = V(Y)$, ask $COV(X+Y, X-Y)$

$$COV(X+Y,\ X-Y) = COV(X,\ X-Y) + COV(Y,\ X-Y)$$

$$= COV(X,\ X) - COV(X,\ Y) + COV(Y,\ X) - COV(Y,\ Y)$$

$$= Var(X) - Var(Y)$$ ※

Q4 $E(X)=3,\ V(X)=9,\ E(y)=4,\ V(y)=16,\ Corr(X,y)=0.25$

(a) $V(X+y)$

$$corr(X,y)=\frac{cov(X,y)}{\sqrt{V(X)\cdot V(y)}} \Rightarrow 0.25=\frac{cov(X,y)}{\sqrt{9\times 16}} \Rightarrow 0.25\times 12=cov(X,y)$$

$$\Rightarrow 3=cov(X,y)$$

$$V(X+y)=V(X)+V(y)+2\cdot Cov(X,y)=9+16+6=31 \#$$

(b) $cov[X, X+Y]$

$$cov(X, X+y)=cov(X+y, X)=cov(X,X)+cov(y,X)$$

$$=Var(X)+3 \Rightarrow 9+3=12 \#$$

(c) $Corr(X+Y, X-Y)$

$$Corr(X+y, X-y) = \frac{cov(X+y, X-y)}{\sqrt{V(X+y)\cdot V(X-y)}} \Rightarrow \frac{(-7)}{\sqrt{28 \times 19}} = (-0,3034)$$

where $cov(X+y, X-y) = cov(X, X-y) + cov(y, X-y)$

$= cov(X, X) - cov(X, y) + cov(y, X) - cov(y, y)$.

$= 9 - 16 = (-7)$

and $V(X+y) = 28$

while $V(X-y) = V(X) + V(y) - 2Cov(X, y) = 9 + 16 - 6 = 19$ #