EECS 203A HW2.

1※ (a) for $r_k = 1, 2, \cdots 49$ $h(r_k) = 10 + r_k$

total number of pixel N: $\sum_{0}^{49}(10+k) = 500 + \frac{49 \cdot 50}{2} = 1725$

CDF: $T(r_k) = \frac{1}{N}\sum_{0}^{k} h(r_i) = \frac{1}{1725}\sum_{0}^{k}(10+i) = \frac{1}{1725}\left(10(k+1) + \frac{k(k+1)}{2}\right)$

$= (k+1)(k+20)/3450$

(b) Transformation $M(r_k)$ for histogram equalization is

$M(r_k) = \text{round}((2^6-1)T(r_k))$

$= \text{round}\left(49 \times \frac{(k+1)(k+20)}{3450}\right)$

(c) histogram of transformed image $h_m(s_j)$ (s_j is new gray level)

$M(r_k)$ must be calculated manually ex) $M(1) = \text{round}\left(49 \times \frac{2 \times 21}{3450}\right| = 1, M(2) = 1, \cdots$

2※ $n_1(x,y) \sim N(0, \sigma^2)$, $n_2(x,y) \sim N(0, \sigma^2)$

(a) $E[g'(x,y)] = 0.5\,E[g_1(x,y)] + 0.25\,E[g_2(x,y)]$

$= 0.5\,f(x,y) + (0.25)(2)\,f(x,y)$

$= f(x,y)$

(b) $Var(g'(x,y)) = (0.5)^2 Var(g_1(x,y)) + (0.25)^2 Var(g_2(x,y))$

$Var(g_1(x,y)) = Var(n_1) = \sigma^2$ / $Var(g_2(x,y)) = Var(n_2) = \sigma^2$

again, $Var(g'(x,y)) = 0.25\sigma^2 + 0.0625\sigma^2 = 0.3125\sigma^2$