$$(1-p)^0 + (1-p)^1 + \cdots + (1-p)^{N-1}$$

$$\frac{(1-p)^N - 1}{1-p-1} \qquad \frac{1-(1-p)^N}{p}$$

$$\sum_{j=1}^{100} \sum_{i=j}^{100} \left(1-\frac{1}{i}\right)$$

$$\frac{3n^2-n}{4n-2}, \qquad \frac{3n^2}{4n-2}$$

13466.7481 50.6278

$$\sum_{i=1}^{100}\left(1-\frac{1}{i}\right) + \sum_{i=2}^{100}\left(1-\frac{1}{i}\right) + \cdots + \sum_{i=100}^{100}\left(1-\frac{1}{i}\right)$$

$$100 - \left(\sum_{i=1}^{100} \frac{1}{i}\right) =$$

$$f_X(x) = 2e^{-2x}$$

$$f_Y(y) = \int_0^\infty \frac{2e^{-2x}}{x}\,dx$$

$$E(X^2) = 2\int_0^\infty x^2 e^{-2x}\,dx = \frac{1}{2}$$

$u \quad v'$

$u' = 2x$

$v = -\frac{1}{2}e^{-2x}$

$$2\left[-\frac{1}{2}x^2 e^{-2x}\right]_0^\infty + 2\int_0^\infty x e^{-2x}\,dx$$

$u \quad v'$

$u = 1$

$v = -\frac{1}{2}e^{-2x}$

$$= 2\left[-\frac{x}{2}e^{-2x}\right]_0^\infty + \int_0^\infty e^{-2x}\,dx$$

$=$

$$\left[-\frac{1}{2}e^{-2x}\right]_0^\infty =$$

$$Var(X) = E(X^2) - E(X)^2 = \frac{1}{2} - \left(\frac{1}{2}\right)^2 = \frac{1}{4}.$$

$$E(Y^2) = \int_0^\infty \int_0^x y^2 \frac{2e^{-2x}}{x} \, dy \, dx$$

$$= \int_0^\infty \frac{2}{3} x^2 e^{-2x} \, dx$$

$$= \frac{2}{3} \cdot \frac{1}{4} = \frac{1}{6}.$$

$$Var(Y) = \frac{1}{6} - \left(\frac{1}{4}\right)^2 = \frac{5}{48}.$$

$$\frac{0.125}{\sqrt{\frac{5}{48} \cdot \frac{1}{4}}}.$$

$\sum_{i=1}^{100} \frac{1}{i} = \frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{100}$

$Var(Y_n + Y_{n+1} + Y_{n+2})$

$= E((Y_n + Y_{n+1} + Y_{n+2})^2) - E(Y_n + Y_{n+1} + Y_{n+2})^2$

$= E((Y_n + Y_{n+1} + Y_{n+2})(Y_n + Y_{n+1} + Y_{n+2}))$

$E(Y_n^2 + 2Y_nY_{n+1} + 2Y_nY_{n+2} + Y_{n+1}^2 + 2Y_{n+1}Y_{n+2} + Y_{n+2}^2)$

$= 3(3\sigma^2 + 9\mu^2) + 4(2\sigma^2 + 9\mu^2) + 2(\sigma^2 + 9\mu^2) + \; - 81\mu^2$

$E(Y_n^2) =$

$Var(Y_n) = 3\sigma^2$

$E(Y_n^2) - E(Y_n)^2 = 3\sigma^2$

$E(Y_n^2) = 3\sigma^2 + 9\mu^2$

$$Cov(Y_n, Y_{n+1}) = E[(Y_n - E(Y_n))(Y_{n+1} - E(Y_{n+1}))]$$

$$= E[Y_n Y_{n+1} - Y_n(3\mu) - Y_{n+1} 3\mu + 9\mu^2]$$

$$= E[Y_n Y_{n+1}] - 9\mu^2$$

$$2\sigma^2 + 9\mu^2$$