② $f(x) = e^{-4x} + 3xe^{-2x^2}$

$$F(x) = \int_{-\infty}^{x} f(x) \cdot dx = \int_{0}^{x} e^{-4x} + 3xe^{-2x^2} \cdot dx$$

$$= -\frac{3}{4} e^{-2x^2} - \frac{e^{-4x}}{4} + 1$$

$F(x) = R \Rightarrow \quad g(x_n) = F(x_n) - R \quad \& \quad g'(x_n) = f(x_n)$

$$x_{n+1} = x_n - \frac{g(x_n)}{g'(x_n)}$$

$$= x_n - \frac{(F(x_n) - R)}{f(x_n)}$$

$$= x_n - \frac{\left(-\frac{3}{4} e^{-2x_n^2} - \frac{e^{-4x_n}}{4} + 1 \quad - R\right)}{e^{-4x_n} + 3x_n e^{-2x_n^2}}$$

$$E(x) = \int_{0}^{\infty} x \cdot f(x) \cdot dx$$

$$= \int_{0}^{\infty} \left(e^{-4x} + 3xe^{-2x^2}\right) \cdot x \cdot dx$$

$$= 0.532493$$

$$E(x^2) = \int_{0}^{\infty} x^2 \cdot f(x) \cdot dx$$

$$= 0.40625$$

$$V(x) = E(x^2) - (E(x))^2$$

$$= 0.40625 - (0.532493)^2$$

$$= 0.40625 - 0.28355$$

$$= 0.1227$$

$$\sigma(x) = 0.3502$$

The results obtained here closely matches with the simulation results.

I got to know that we may have to use the acceptance - rejection technique and trying that as well in the last minute.

$$f(x) = e^{-4x} + 3x e^{-2x^2}$$

$$g(x) = 1$$

$$d\left(f(x)\right) = -4e^{-4x} + 3\left(x(-4x)e^{-2x^2} + e^{-2x^2} \times 1\right)$$

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = -4e^{-4x} + 3\left(-4x^2 e^{-2x^2} + e^{-2x^2}\right) = 0$$

$$\Rightarrow x = 0.082,\ 0.395$$

$$f(0.395) = 0.0015139$$

$$f(0.082) = -0.0011361$$

$$c = f(0.395) = 0.0015139$$