$$g(x,x') = \left[1+\theta|x-x'|+\frac{1}{3}\theta^2|x-x'|^2\right]\exp\{-\theta|x-x'|\}$$

$$\frac{\partial}{\partial x}g(x,x') = \left[\theta sign(x-x')+\frac{2}{3}\theta^2(x-x')\right]\exp\{-\theta|x-x'|\}$$

$$+\left[1+\theta|x-x'|+\frac{1}{3}\theta^2(x-x')^2\right]\exp\{-\theta|x-x'|\}(-\theta sign(x-x'))$$

$$= \exp\{-\theta|x-x'|\}\left[\theta sign(x-x')+\frac{2}{3}\theta^2(x-x')-\theta sign(x-x')-\theta^2|x-x'|sign(x-x')-\frac{1}{3}\theta^3(x-x')^2 sign(x-x')\right]$$

$$= \exp\{-\theta|x-x'|\}\left[-\frac{1}{3}\theta^2(x-x')-\frac{1}{3}\theta^3(x-x')^2 sign(x-x')\right]$$

$$= \exp\{-\theta|x-x'|\}\left(-\frac{1}{3}\theta^2(x-x')\right)\left[1+\theta(x-x')sign(x-x')\right]$$

$$= -\frac{1}{3}\theta^2(x-x')\left[1+\theta|x-x'|\right]\exp\{-\theta|x-x'|\}$$

$$\frac{\partial^2}{\partial x'\partial x}g(x,x') = \frac{\partial}{\partial x'}\left[-\frac{1}{3}\theta^2(x-x')\left[1+\theta|x-x'|\right]\exp\{-\theta|x-x'|\}\right]$$

$$= \frac{\partial}{\partial x'}\left[\left[-\frac{1}{3}\theta^2(x-x')-\frac{1}{3}\theta^3(x-x')^2 sign(x-x')\right]\exp\{-\theta|x-x'|\}\right]$$

$$= \left[\frac{1}{3}\theta^2-\frac{2}{3}\theta^3(x-x')(-1)sign(x-x')\right]\exp\{-\theta|x-x'|\}$$

$$+\left[-\frac{1}{3}\theta^2(x-x')-\frac{1}{3}\theta^3(x-x')^2 sign(x-x')\right]\exp\{-\theta|x-x'|\}(\theta sign(x-x'))$$

$$= \exp\{-\theta|x-x'|\}\left[\frac{1}{3}\theta^2+\frac{2}{3}\theta^3|x-x'|-\frac{1}{3}\theta^3|x-x'|-\frac{1}{3}\theta^4(x-x')^2\right]$$

$$= \exp\{-\theta|x-x'|\}\left[\frac{1}{3}\theta^2+\frac{1}{3}\theta^3|x-x'|-\frac{1}{3}\theta^4(x-x')^2\right]$$

$$= \frac{1}{3}\theta^2\left[1+\theta|x-x'|-\theta^2(x-x')^2\right]\exp\{-\theta|x-x'|\}$$