In[∘]:=
```
lb1[q_] := σ[q] Log[(Exp[ϵ] - (1 - q)) / q] - 1 / (2 σ[q])
```

In[∘]:=
```
lb2[q_] := σ[q] Log[(Exp[ϵ] - (1 - q)) / q] + 1 / (2 σ[q])
```

In[∘]:=
```
delta[q_] := q (1 - CDF[NormalDistribution[0, 1], lb1[q]]) +
  (1 - q - Exp[ϵ]) (1 - CDF[NormalDistribution[0, 1], lb2[q]])
```

In[∘]:=
```
D[delta[q], {q, 1}]
```

Out[∘]=

$$\frac{1}{2}\,\mathrm{Erfc}\left[\frac{-\frac{1}{2\,\sigma[q]}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]}{\sqrt{2}}\right]-\frac{1}{2}\,\mathrm{Erfc}\left[\frac{\frac{1}{2\,\sigma[q]}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]}{\sqrt{2}}\right]+$$

$$\frac{e^{-\frac{1}{2}\left(\frac{1}{2\,\sigma[q]}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]\right)^{2}}\,q\left(-\frac{q\left(\frac{1}{q}-\frac{-1+e^{\epsilon}+q}{q^{2}}\right)\sigma[q]}{-1+e^{\epsilon}+q}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma'[q]-\frac{\sigma'[q]}{2\,\sigma[q]^{2}}\right)}{\sqrt{2\,\pi}}+$$

$$\frac{e^{-\frac{1}{2}\left(-\frac{1}{2\,\sigma[q]}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]\right)^{2}}\,(1-e^{\epsilon}-q)\left(-\frac{q\left(\frac{1}{q}-\frac{-1+e^{\epsilon}+q}{q^{2}}\right)\sigma[q]}{-1+e^{\epsilon}+q}-\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma'[q]+\frac{\sigma'[q]}{2\,\sigma[q]^{2}}\right)}{\sqrt{2\,\pi}}$$

In[∘]:=
```
Simplify[%4]
```

Out[∘]=

$$\frac{1}{2}\left(-\mathrm{Erfc}\left[\frac{1-2\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]^{2}}{2\,\sqrt{2}\,\sigma[q]}\right]+\mathrm{Erfc}\left[-\frac{1+2\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]^{2}}{2\,\sqrt{2}\,\sigma[q]}\right]-\frac{e^{-\frac{1+4\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]^{2}\sigma[q]^{4}}{8\,\sigma[q]^{2}}}\sqrt{\frac{2}{\pi}}\;q\,\sqrt{\frac{-1+e^{\epsilon}+q}{q}}\;\sigma'[q]}{\sigma[q]^{2}}\right)$$

In[∘]:=
```
Solve[%5 == 0, σ'[q]]
```

Out[∘]=

$$\left\{\left\{\sigma'[q]\to-\frac{e^{\frac{1}{8\,\sigma[q]^{2}}+\frac{1}{2}\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]^{2}\sigma[q]^{2}}\sqrt{\frac{\pi}{2}}\left(\mathrm{Erfc}\left[\frac{1-2\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]^{2}}{2\,\sqrt{2}\,\sigma[q]}\right]-\mathrm{Erfc}\left[-\frac{1+2\,\mathrm{Log}\left[\frac{-1+e^{\epsilon}+q}{q}\right]\sigma[q]^{2}}{2\,\sqrt{2}\,\sigma[q]}\right]\right)\sigma[q]^{2}}{q\,\sqrt{\frac{-1+e^{\epsilon}+q}{q}}}\right\}\right\}$$