In[53]:=

```
(* Defining B(0,T) *)
B = E^(-r*T)
(* Defining k *)
k = Log[(V)/(B*K)]
(* Defining Pt{No Default} *)
t = CDF[(k+(0.5*q))/(q^(1/2))] - E^(-2k)*(CDF[(-k + (0.5*q))/(q^(1/2))])
(* Defining Pv{No Default} *)
v = CDF[(k-(0.5*q))/(q^(1/2))] - E^(-2k)*(CDF[(-k - (0.5*q))/(q^(1/2))])

(* Partial Derivative of E, w.r.t V *)
a = D[(K*B*t) - (V*v),V]

(* Simplify this result *)
Simplify[a]
```

Out[53]=

$$e^{-r\,T}$$

Out[54]=

$$\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]$$

Out[55]=

$$-\frac{e^{-2\,r\,T}\,K^2\,\text{CDF}\left[\frac{0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{V^2}+\text{CDF}\left[\frac{0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]$$

Out[56]=

$$-\frac{e^{-2\,r\,T}\,K^2\,\text{CDF}\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{V^2}+\text{CDF}\left[\frac{-0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]$$

Out[57]=

$$\frac{e^{-2\,r\,T}\,K^2\,\text{CDF}\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{V^2}-\text{CDF}\left[\frac{-0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]-$$

$$V\left(\frac{2\,e^{-2\,r\,T}\,K^2\,\text{CDF}\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{V^3}+\frac{e^{-2\,r\,T}\,K^2\,\text{CDF}'\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{\sqrt{q}\;V^3}+\frac{\text{CDF}'\left[\frac{-0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{\sqrt{q}\;V}\right)+$$

$$e^{-r\,T}\,K\left(\frac{2\,e^{-2\,r\,T}\,K^2\,\text{CDF}\left[\frac{0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{V^3}+\frac{e^{-2\,r\,T}\,K^2\,\text{CDF}'\left[\frac{0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{\sqrt{q}\;V^3}+\frac{\text{CDF}'\left[\frac{0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]}{\sqrt{q}\;V}\right)$$

Out[58]=

$$-\frac{1}{\sqrt{q}\ V^3}\,e^{-3\,r\,T}\left(e^{r\,T}\,K^2\,\sqrt{q}\ V\,\text{CDF}\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]-\right.$$

$$2\,K^3\,\sqrt{q}\ \text{CDF}\left[\frac{0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]+e^{3\,r\,T}\,\sqrt{q}\ V^3\,\text{CDF}\left[\frac{-0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]+$$

$$e^{r\,T}\,K^2\,V\,\text{CDF}'\left[\frac{-0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]-K^3\,\text{CDF}'\left[\frac{0.5\,q-\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]+$$

$$\left.e^{3\,r\,T}\,V^3\,\text{CDF}'\left[\frac{-0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]-e^{2\,r\,T}\,K\,V^2\,\text{CDF}'\left[\frac{0.5\,q+\text{Log}\left[\frac{e^{r\,T}\,V}{K}\right]}{\sqrt{q}}\right]\right)$$