Flow-Velocity function from IDM at equilibrium:

Setting up the equations and constants.

In[1]:= $se_{vo\_,s0\_,T\_}[v\_] = \frac{s0 + v * T}{\left(1 - \left(\frac{v}{v0}\right)^4\right)^{0.5}}$

Out[1]= $\frac{s0 + T\,v}{\left(1 - \frac{v^4}{v0^4}\right)^{0.5}}$

In[2]:= $l = 5$

Out[2]= 5

In[5]:= $Q_{s0\_,v0\_,T\,\_}[v\_] = \frac{v}{\frac{s0+v*T}{\left(1-\left(\frac{v}{v0}\right)^4\right)^{0.5}} + l}$

Set: Tag Times in $Q_{s0\_,v0\_,T\,\_}[v\_]$ is Protected.

Out[5]= $\frac{v}{5 + \frac{s0+T\,v}{\left(1-\frac{v^4}{v0^4}\right)^{0.5}}}$

Calculating the derivatives:

$dQds0_{v0\_,s0\_,T\_}[v\_] = \text{Simplify}\left[\partial_{s0} \frac{v}{5 + \frac{s0+T\,v}{\left(1-\frac{v^4}{v0^4}\right)^{0.5}}}\right]$

Out[12]= $-\frac{v\left(1 - \frac{v^4}{v0^4}\right)^{0.5}}{\left(s0 + T\,v + 5\left(1 - \frac{v^4}{v0^4}\right)^{0.5}\right)^2}$

In[10]:= $dQdv0 = \text{Simplify}\left[\partial_{v0} \frac{v}{5 + \frac{s0+T\,v}{\left(1-\frac{v^4}{v0^4}\right)^{0.5`}}}\right]$

Out[10]= $\left(2.\,v^5\,(s0 + T\,v)\right) \Big/ \left(\left(s0 + T\,v + 5.\left(1 - \frac{v^4}{v0^4}\right)^{0.5}\right)^2 \left(1 - \frac{v^4}{v0^4}\right)^{0.5} v0^5\right)$

In[11]:= $dQdT = \text{Simplify}\left[\partial_{T} \frac{v}{5 + \frac{s0+T\,v}{\left(1-\frac{v^4}{v0^4}\right)^{0.5`}}}\right]$

Out[11]= $-\frac{v^2\left(1 - \frac{v^4}{v0^4}\right)^{0.5}}{\left(s0 + T\,v + 5\left(1 - \frac{v^4}{v0^4}\right)^{0.5}\right)^2}$

Plotting the graphs for the partial derivative of Q wrt to s0.

In[13]:=
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Plot[
 Evaluate@Table[dQds0_{v0,s0,T}[v], {v0, 3, 30, 3}, {s0, 0, 5, 0.5}, {T, 1, 3, 0.5}], {v, 0, 30}]
```

Out[13]=