# 4.2)

## a)

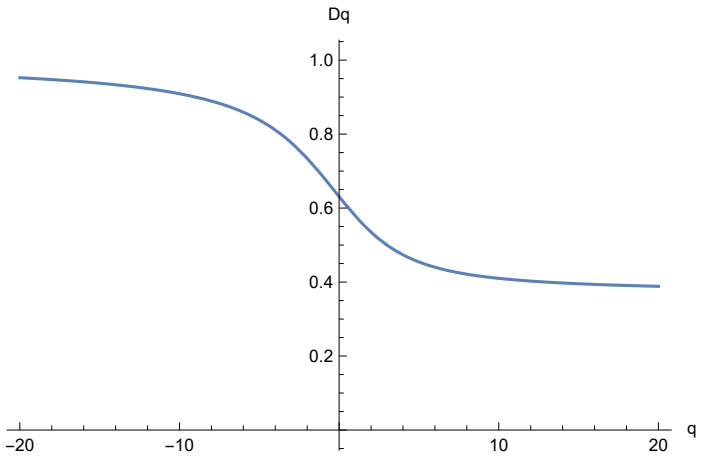
In[5]:=
```
(*The answer is derived by paper and pen,
so it is attached in a seperate file in OpenTa*)
Dq[q_] := 1 / (1 - q) * Log[(2 / 3) ^q + (1 / 3) ^q] / Log[3];
Dq[q]
```

Out[6]=
$$\frac{\text{Log}\left[\left(\frac{2}{3}\right)^{q}+3^{-q}\right]}{(1-q)\,\text{Log}[3]}$$

## b)

In[17]:=
```
DqPlot = Plot[Dq[q], {q, -20, 20}];
Show[DqPlot, AxesLabel → {"q", "Dq"},
 PlotRange → {{-20, 20}, {0, 1}}, AxesOrigin → {0, 0}]
```

Out[18]=




## c)

```
(*Just put in the values for q,
so q=1 and q=2! Need limit for q=1 otherwise it will be zero in the denominator*)
D1 = Limit[Dq[q], q → 1]
D2 = Dq[2]
```

Out[15]=
$$\frac{\text{Log}\left[\frac{27}{4}\right]}{\text{Log}[27]}$$

Out[16]=
$$\frac{\text{Log}\left[\frac{9}{5}\right]}{\text{Log}[3]}$$

## d)

In[22]:=
```
(*Just make the q go to infinity and in the other case -infinity*)
DInf = Limit[Dq[q], q → Infinity]
DNegativeInf = Limit[Dq[q], q → -Infinity]
```

Out[22]= $\frac{\text{Log}\left[\frac{3}{2}\right]}{\text{Log}[3]}$

Out[23]= 1