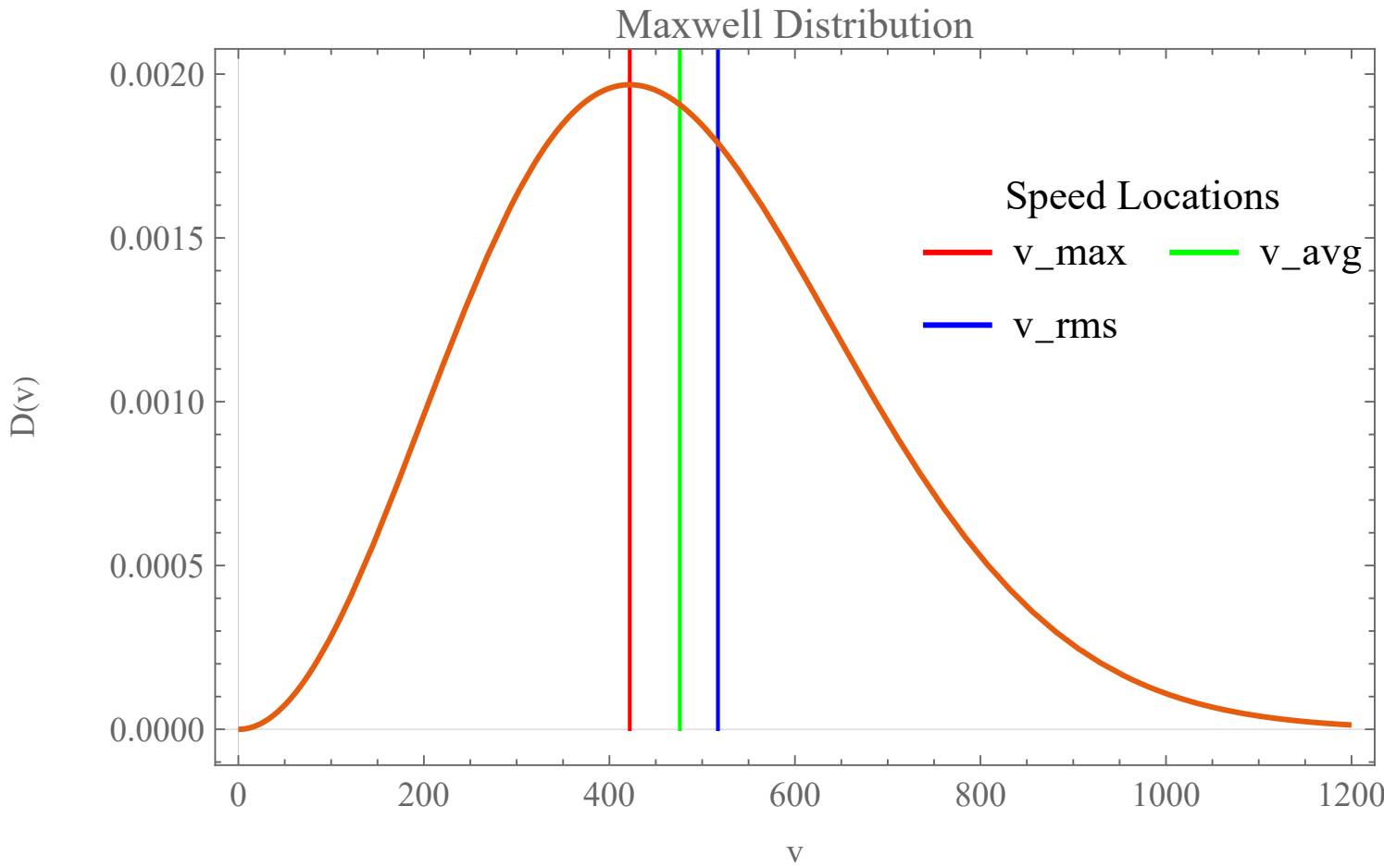


Q3)

```
v0 =  $\sqrt{\frac{2 * 1.3806488 * 10^{-23} * 300}{28.02 * 1.660538921 * 10^{-27}}}$  ;

MD[v_] :=  $\frac{4}{\sqrt{\pi}} * \frac{v^2}{v0^3} * \text{Exp}\left[\frac{-v^2}{v0^2}\right]$  ;

Plot[MD[v], {v, 0, 1200}, PlotTheme -> "Scientific", FrameLabel -> {"v", "D(v)"} , Prolog -> {Red, Line[{{422, 0}, {422, 1}}], Blue, Line[{{517, 0}, {517, 1}}], Green, Line[{{476, 0}, {476, 1}}]}, PlotLabel -> "Maxwell Distribution", PlotLegends -> Placed[LineLegend[{Red, Blue, Green}, {"v_max", "v_rms", "v_avg"}], LegendLabel -> "Speed Locations", LegendLayout -> {"Column", 2}], {0.8, 0.7}]
```



```
Integrate[MD[v], {v, 300, 572}]

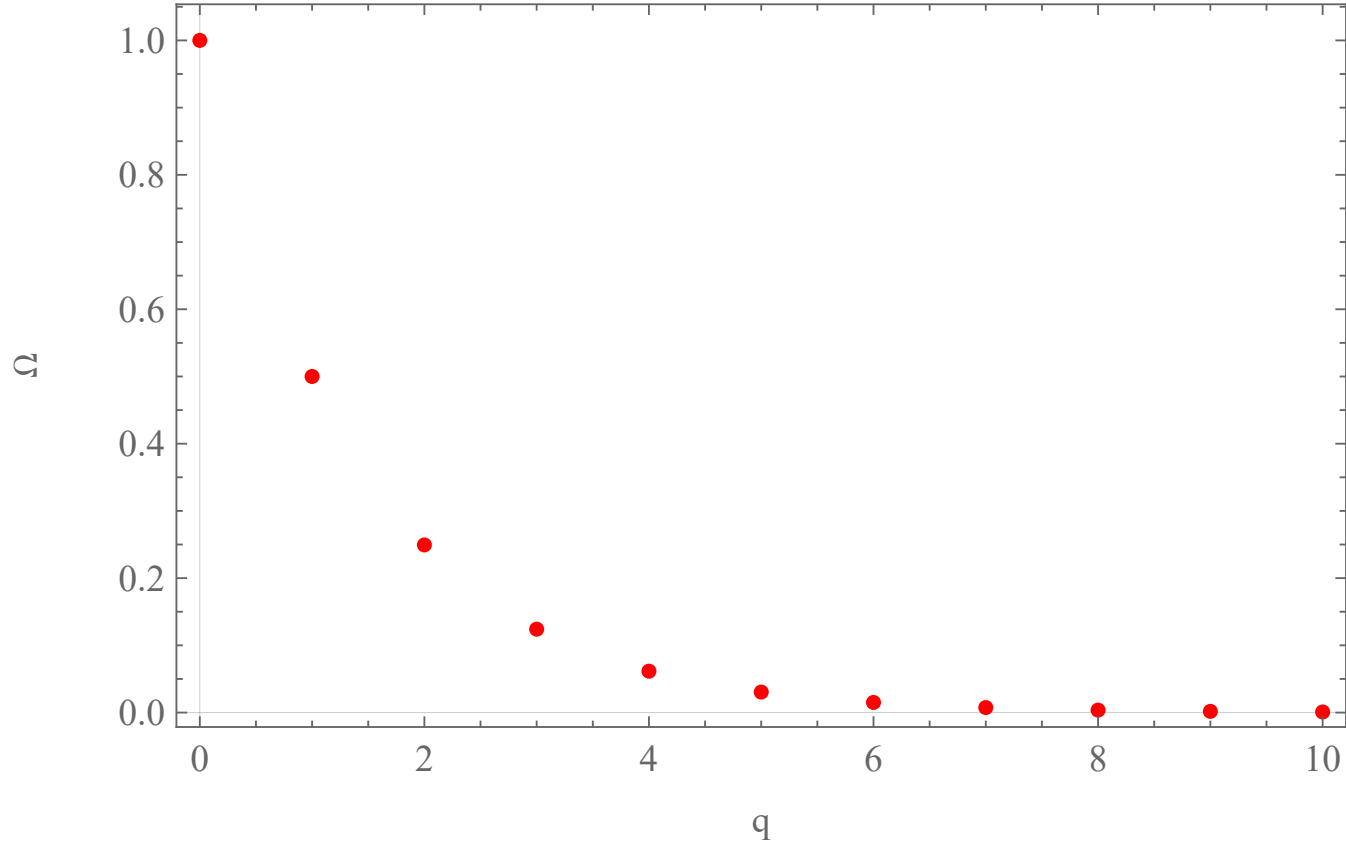
0.499873
```

Q5)

a) & b)

```
mq1[q_] :=  $\frac{\text{Binomial}[200 + 200 - q, 200 - q]}{\text{Binomial}[200 + 200, 200]}$ 

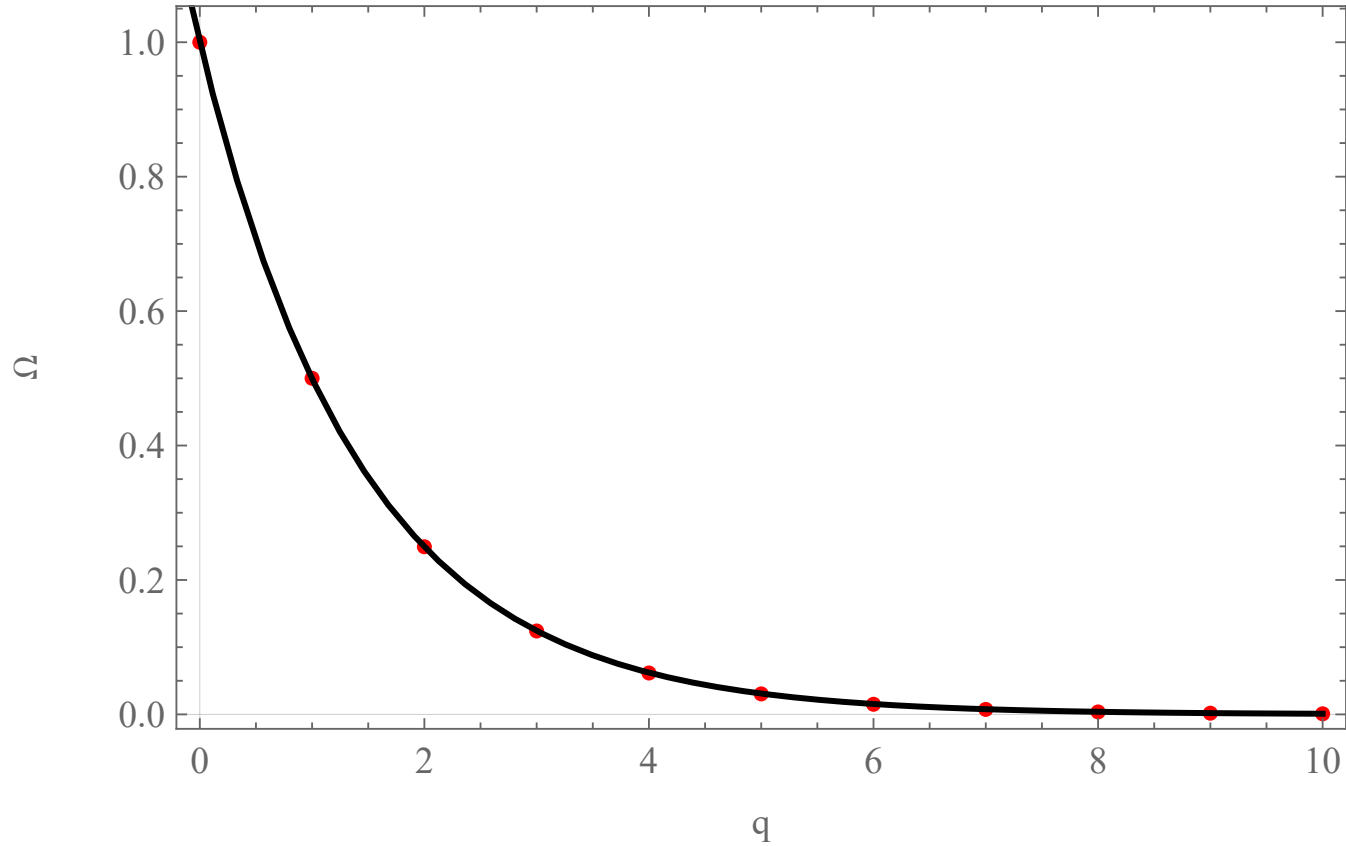
ListPlot[Table[mq1[q], {q, 0, 10}], PlotTheme -> "Scientific", FrameLabel -> {"q", "Ω"} , DataRange -> {0, 10}, PlotStyle -> Red, PlotRange -> All]
```



```
FindFit[Table[mq1[q], {q, 0, 10}], a * Exp[-q/b], {a, b}, q]

{a -> 2.00389, b -> 1.43923}
```

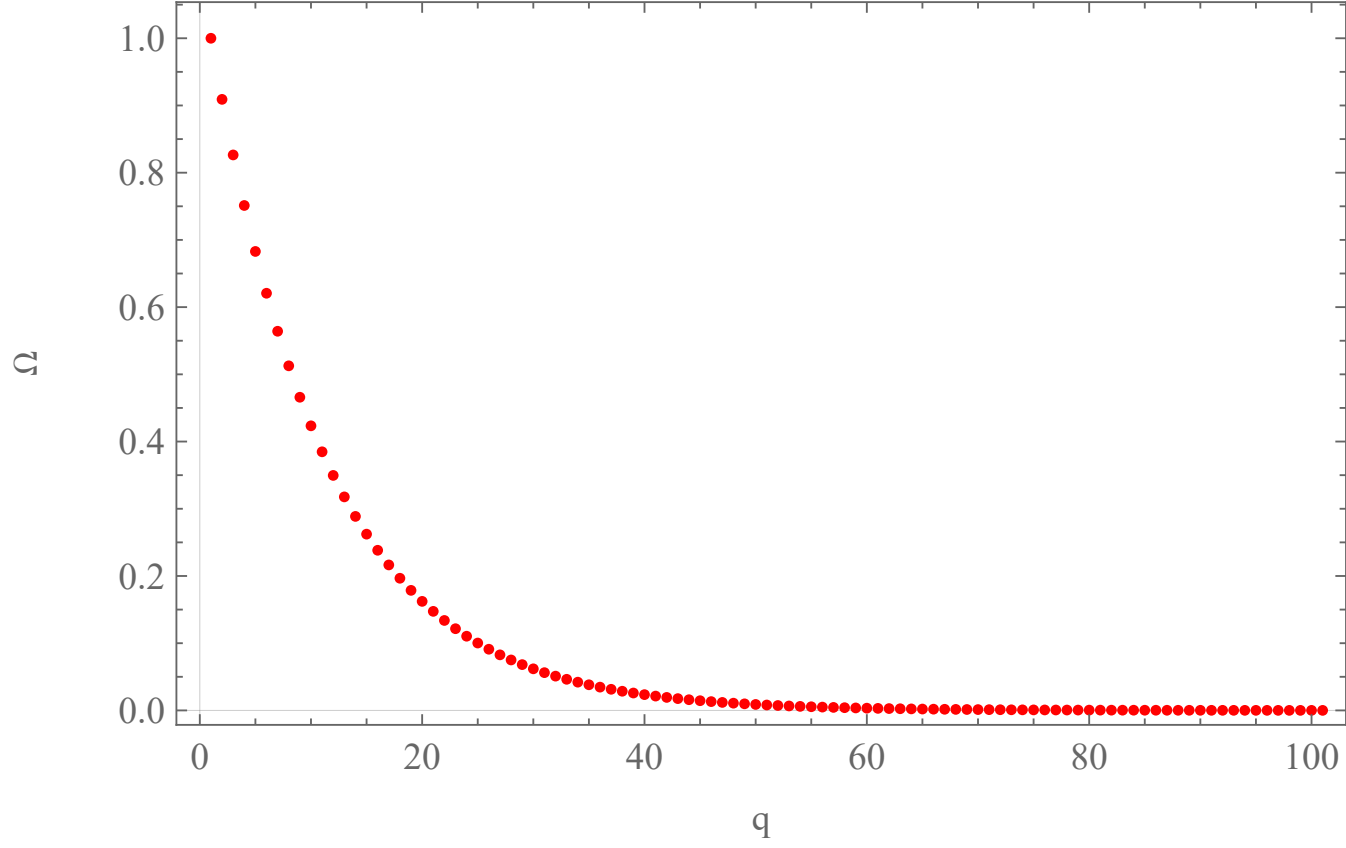
```
Show[ListPlot[Table[mq1[q], {q, 0, 10}], PlotStyle -> Red, PlotTheme -> "Scientific", FrameLabel -> {"q", "Ω"} , DataRange -> {0, 10}], Plot[a Exp[- $\frac{q+1}{b}$ ]/. {a -> 2.00389, b -> 1.43923}, {q, -1, 10}, PlotStyle -> Black]]
```



d)

```
mq2[q_] :=  $\frac{\text{Binomial}[2000 + 200 - q, 2000 - q]}{\text{Binomial}[2000 + 200, 2000]}$ 

ListPlot[Table[mq2[q], {q, 0, 100}], PlotTheme -> "Scientific", FrameLabel -> {"q", "Ω"} , PlotStyle -> Red, PlotRange -> All]
```



```
FindFit[Table[mq2[q], {q, 0, 100}], a * Exp[- $\frac{q}{b}$ ], {a, b}, q]

{a -> 1.10161, b -> 10.4446}
```

```
Show[ListPlot[Table[mq2[q], {q, 0, 100}], PlotRange -> All, PlotStyle -> Red, PlotTheme -> "Scientific", FrameLabel -> {"q", "Ω"} , DataRange -> {0, 100}], Plot[a Exp[- $\frac{q}{b}$ ]/. {a -> 1.10161, b -> 10.4446}, {q, -10, 100}, PlotStyle -> Black]]
```

