In[ ]:=
```
S = {1, 1.5, 2}
dS = S[[2]] - S[[1]]
nCP = {0, 0.4, 1} (*cumulative number probability values*)
nP = Differences[nCP] (*number probability values*)
```

Out[ ]= {1, 1.5, 2}

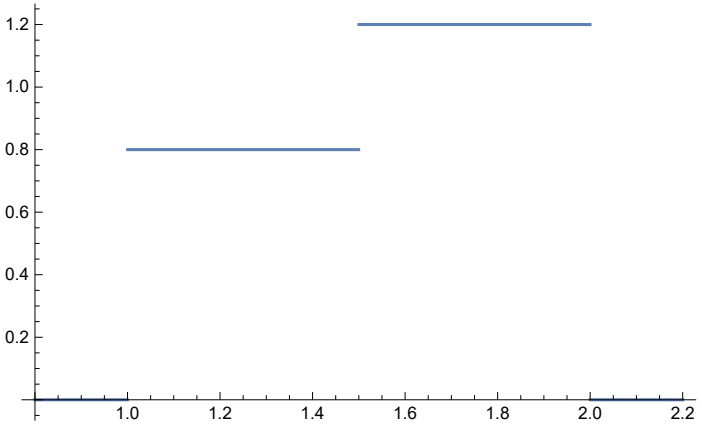
Out[ ]= 0.5

Out[ ]= {0, 0.4, 1}

Out[ ]= {0.4, 0.6}

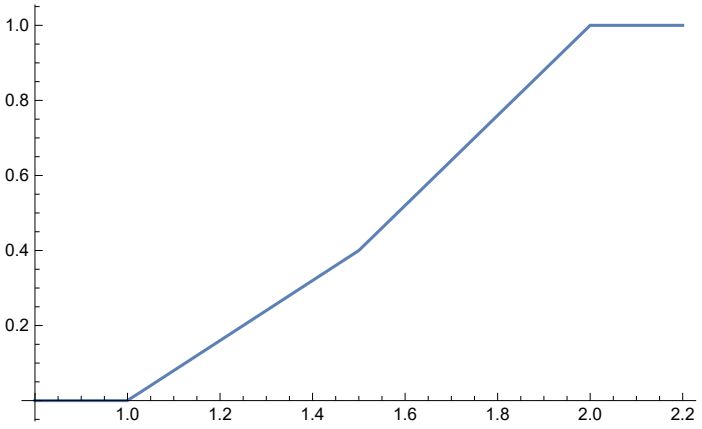
In[ ]:=
```
(*number particle size distribution*)
npsd[s_] :=
 Piecewise[{{0, s < S[[1]]}, {nP[[1]] / dS, s < S[[2]]}, {nP[[2]] / dS, s < S[[3]]}}, 0]
Plot[npsd[s], {s, .8, 2.2}]
```

Out[ ]=



In[ ]:=
```
(*cumulative number particle size distribution*)
ncsd[s_] := Integrate[npsd[σ], {σ, S[[1]], s}]
Plot[ncsd[s], {s, .8, 2.2}]
ncsd[S[[2]]]
```

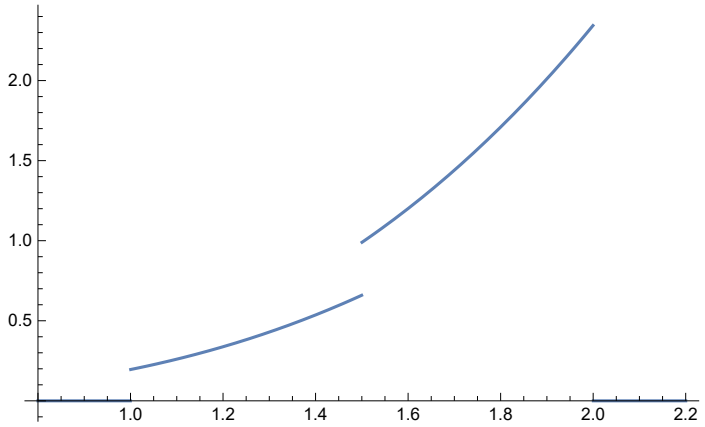
Out[ ]=



Out[ ]= 0.4

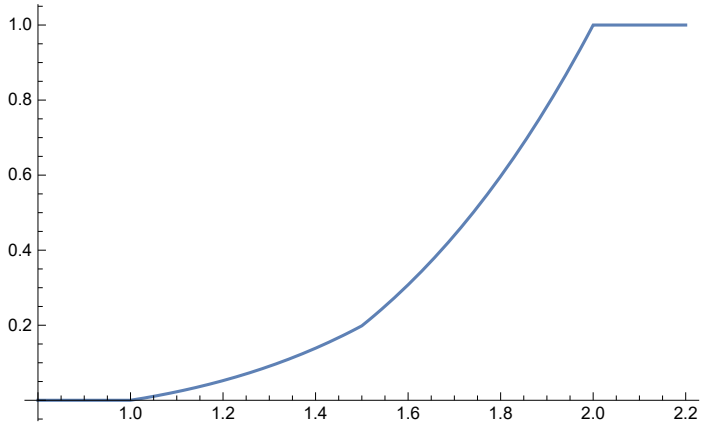
```
(*volumetric particle size distribution*)
V = Integrate[npsd[s] s^3, {s, S[[1]], S[[3]]}];
psd[s_] := npsd[s] s^3 / V
Plot[psd[s], {s, .8, 2.2}]
```

Out[ ]=




```
(*volumetric number particle size distribution*)
csd[s_] := Integrate[psd[σ], {σ, S[[1]], s}]
Plot[csd[s], {s, .8, 2.2}]
```

Out[ ]=



In[ ]:=
```
(*volumetric cumulative probability values*)
CP = Table[csd[S[[i]]], {i, 3}]
(*number probability values*)
P = Differences[CP]
```

Out[ ]= {0, 0.198473, 1.}

Out[ ]= {0.198473, 0.801527}

```
(*Derive conversion factor
  np₂=ncsd(s₂)-ncsd(s₁)
    npsd([s₁,s₂]) = np₂/ds
    psd(s) =npsd(s) s³= s³/ds np₂
      p₂=csd(s₂)-csd(s₁) =Integrate[s³/ds,{s,s₁,s₂}] np₂
*)
Factor[Simplify[Integrate[s^3/(s2 - s1), {s, s1, s2}], Assumptions → {s2 > s1, s1 > 0}]]
```

Out[•]= $\frac{1}{4}\left(s1+s2\right)\left(s1^2+s2^2\right)$

```
In[•]:= (*Convert nP- to p-values:*)
P1 = Table[nP[[i]] (S[[i + 1]]^2 + S[[i]]^2) (S[[i + 1]] + S[[i]]), {i, 2}];
P1 = P1 / Sum[P1[[i]], {i, 2}]
(*Compare with original values*)
P
```

Out[•]= {0.198473, 0.801527}

Out[•]= {0.198473, 0.801527}

```
(*Area to Number*)
Factor[Simplify[Integrate[s^2/(s2 - s1), {s, s1, s2}], Assumptions → {s2 > s1, s1 > 0}]]
(*Length to Number*)
Factor[Simplify[Integrate[s^1/(s2 - s1), {s, s1, s2}], Assumptions → {s2 > s1, s1 > 0}]]
```

Out[•]= $\frac{1}{3}\left(s1^2+s1\,s2+s2^2\right)$

Out[•]= $\frac{s1+s2}{2}$