Calculation of the limit in Exercise 4 of Section 6.11 in G & S

In[2]:=
```
Clear[G, mu, lambda, s, t];
G[mu_, lambda_, s_, t_] := (mu * (1 - s) - (mu - lambda * s) * Exp[-t * (lambda - mu)]) /
  (lambda * (1 - s) - (mu - lambda * s) * Exp[-t * (lambda - mu)]);
```

In[5]:=
```
Limit[(G[mu, lambda, s, t] - G[mu, lambda, 0, t]) / (1 - G[mu, lambda, 0, t]),
 t → Infinity, Assumptions → mu > lambda]
```

Out[5]=
$$\frac{(\text{lambda} - \text{mu})\ s}{-\text{mu} + \text{lambda}\ s}$$

Note that this is equal to

In[9]:=
```
(1 - rho) * s / (1 - rho * s)
```

Out[9]=
$$\frac{(1 - \text{rho})\ s}{1 - \text{rho}\ s}$$

In[11]:=
```
Simplify[Sum[s^n * (1 - p)^(n - 1) * p, {n, 1, Infinity}]]
```

Out[11]=
$$\frac{p\ s}{1 + (-1 + p)\ s}$$

Hence we have a geometric distribution with parameter 1 - rho