

In[8]:= **g[y\_]** := **-100 + 20 (k^2 - k 1 + 1^2) y + 4 (k^2 - k 1 + 1^2)^2 y^2 + k^2 (k - 1)^2 1^2 y^3**

In[10]:= **f[x\_]** := **g[x / (k^2 - k 1 + 1^2)]**

In[31]:= **f[x]**

Out[31]= 
$$-100 + 20 x + 4 x^2 + \frac{k^2 (k - 1)^2 1^2 x^3}{(k^2 - k 1 + 1^2)^3}$$

In[35]:= **Solve[-100 + 20 x + 4 x^2 + 0 x^3 == 0, x]**

Out[35]=  $\left\{ \left\{ x \rightarrow \frac{5}{2} (-1 - \sqrt{5}) \right\}, \left\{ x \rightarrow \frac{5}{2} (-1 + \sqrt{5}) \right\} \right\}$

In[52]:= **Solve[-100 + 20 x + 4 x^2 + u[1/2] x^3 == 0, x]**

Out[52]=  $\left\{ \{x \rightarrow -15\}, \{x \rightarrow -15\}, \{x \rightarrow 3\} \right\}$

In[48]:= **f2[x\_]** := **-100 + 20 x + 4 x^2 + u x^3**  
**u[t\_]** := **(1 - t)^2 t^2 / (1 - t + t^2)^3**  
**Simplify[u[t] - u[1 - t]]**  
**Solve[u'[t] == 0, t]**

Out[50]= **0**

Out[51]=  $\left\{ \{t \rightarrow -1\}, \{t \rightarrow 0\}, \left\{ t \rightarrow \frac{1}{2} \right\}, \{t \rightarrow 1\}, \{t \rightarrow 2\} \right\}$

In[29]:= **Plot[u[t], {t, 0, 1}]**

