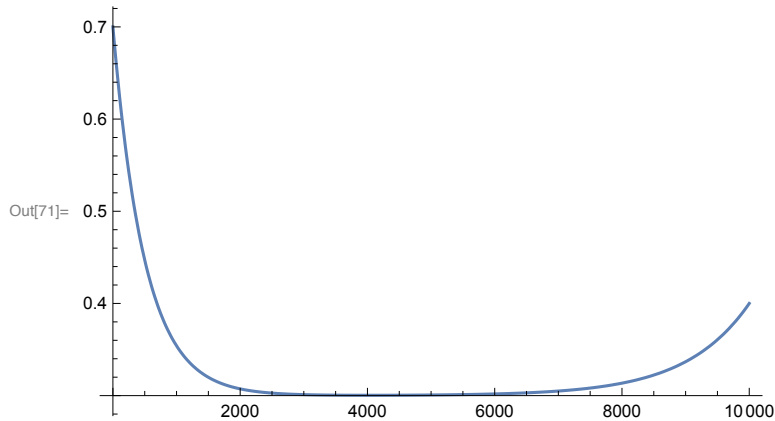


```
In[63]:= gc[a_, b_, c_, d_, e_, L_, x_] = (a - e) (1 - c)^x + (b - e) (1 - d)^L-x + e;
```

```
In[71]:= Plot[gc[0.7, 0.4, 0.002, 0.001, 0.3, 10 000, x], {x, 0, 10 000}, PlotRange -> All]
```



1.1

```
In[105]:= gcexon[a_, b_, c_, d_, e_, L_, i_, j_] =
Simplify[
$$\frac{\text{Integrate}[(a - e) (1 - c)^x + (b - e) (1 - d)^{L-x} + e, \{x, i, j\}]}{j - i},$$

{0 < i < j < L, a > 0, b > 0, e > 0, 0 < c < 1, 0 < d < 1}]
```

```
Out[105]= 
$$\frac{\left( (1-d)^{-i-j} \left( \left( (1-c)^i - (1-c)^j \right) (1-d)^{i+j} (a-e) \text{Log}[1-d] + \right. \right.}{\left. \left( (i-j) \text{Log}[1-c] \text{Log}[1-d] \right) \right)} \left( \left( (1-d)^i - (1-d)^j \right) (1-d)^L (b-e) + (1-d)^{i+j} e (i-j) \text{Log}[1-d] \right) \right) /$$

```

```
In[102]:= gcexon[0.7, 0.4, 0.002, 0.001, 0.3, 10 000, 0, 10 000]
gcexonApprox[0.7, 0.4, 0.002, 0.001, 0.3, 10 000, 0, 10 000]
```

```
Out[102]= 0.329975
```

```
Out[103]= 0.33
```

```
In[107]:= gcexonApprox[a_, b_, c_, d_, e_, L_, i_, j_] =
FullSimplify[
$$\left( (1-d)^{-i-j} \left( \left( (1-c)^i - (1-c)^j \right) (1-d)^{i+j} (a-e) \text{Log}[1-d] + \text{Log}[1-c] \right. \right. \right. \\ \left. \left( (1-d)^i - (1-d)^j \right) (1-d)^L (b-e) + (1-d)^{i+j} e (i-j) \text{Log}[1-d] \right) \right) /$$


$$\left( (i-j) \text{Log}[1-c] \text{Log}[1-d] \right) /. \{ (1-c)^i \rightarrow \text{Exp}[-c i], (1-c)^j \rightarrow \text{Exp}[-c j],$$


$$(1-d)^i \rightarrow \text{Exp}[-d i], (1-d)^j \rightarrow \text{Exp}[-d j], (1-d)^{i+j} \rightarrow \text{Exp}[-d (i+j)],$$


$$(1-d)^{-i-j} \rightarrow \text{Exp}[d (i+j)], \text{Log}[1-d] \rightarrow -d, \text{Log}[1-c] \rightarrow -c, (1-d)^L \rightarrow \text{Exp}[-d L] \},$$

{0 < i < j < L, a > 0, b > 0, e > 0, 0 < c < 1, 0 < d < 1}]
```

```
Out[107]= 
$$\frac{1}{c d (i-j)} e^{d (i+j)} \left( d (a-e) e^{-(c+d) (i+j)} \left( e^{c i} - e^{c j} \right) + c (b-e) e^{-d (i+j+L)} \left( e^{d i} - e^{d j} \right) + c d e e^{-d (i+j)} (i-j) \right)$$

```