Cas de la Transformada de Laplace:

$\mathcal{L}\{t^a\}= \int_0^\infty t^a . e^{-st}.dt = t^a . \frac{e^{-st}}{-s}\Big|_0^\infty - \int_0^\infty a.\frac{1}{-s} t^a . e^{-st}.dt =$

$u_1= t^a \quad du_1= a.t^{a-1}.dt$

$dv_1= e^{-st}.dt \quad v_1= \frac{e^{-st}}{-s}$

$= t^a . \frac{e^{-st}}{-s}\Big|_0^\infty + \frac{a}{s}.\Gamma(a)$

0 $\qquad \frac{1}{s}.a.\Gamma(a)= \frac{1}{s}.\Gamma(a+1)$

Suposant que $0.\infty \to 0$

$\frac{a}{s}.t^{a-1}.\frac{e^{-st}}{-s}\Big|_0^\infty - \frac{a}{s}\int_0^\infty (a-1).\frac{1}{-s} t^{a-2}.e^{-st}.dt =$

També suposem que=0

$u_2= t^{a-1} \quad du_2= (a-1).t^{a-2}.dt$ $\qquad \frac{1}{s^2}.a.(a-1).\Gamma(a+1)=$

$dv_2= e^{-st}.dt \quad v_2= \frac{e^{-st}}{-s}$ $\qquad = \frac{1}{s^2}.\Gamma(a+2)$

i si tornem a aplicar la integral per parts:

$0- \frac{a}{s^2}\int_0^\infty (a-1)(a-2).t^{a-3}.\frac{1}{-s}e^{-st}.dt =$

$= \frac{a.(a-1).(a-2)}{s^3}.\Gamma(a+2)$

i en un altre pas, $\frac{a.(a-1).(a-2).(a-3)}{s^4}.\Gamma(a+3)$ etzètera…

Sabent que: $\Gamma(a+2)= (a+1).\Gamma(a+1)= (a+1).a.\Gamma(a)$

i en general: $\Gamma(a+n)= (a+(n-1))\ldots(a+(n-2))\ldots(a).\Gamma(a)$

per tant, $\mathcal{L}\{t^a\}= \frac{a.(a-1).(a-2)\ldots(a-n)}{s^{n+1}}.\Gamma(a+n)$