Laplace transform $L\{f(t)\} = \mathrm{F}(s) = \int_0^\infty e^{-st} f(t)dt$

$\Gamma(p) = \int_0^\infty x^{p-1} e^{-x} dx$

Verify that $L\{t^n e^{at}\} = \dfrac{\Gamma(n+1)}{(s-a)^{n+1}}, s > a$

$$L\{t^n e^{at}\} = \int_0^\infty e^{-(s-a)t} t^n dt \overset{\substack{s-a=b \\ bt=x}}{=} \frac{1}{b^{n+1}} \int_0^\infty x^n e^{-x} dx = \frac{\Gamma(n+1)}{(s-a)^{n+1}}, s > a$$