PROOF OF FORMULA 3.197.2

$$\int_a^\infty x^{-\lambda}(x+b)^\nu(x-a)^{\mu-1}\,dx = a^{-\lambda}(a+b)^{\mu+\nu}B(\mu,\lambda-\mu-\nu)_2F_1\left[\lambda,\mu;\lambda-\nu+\rho;-b/a\right]$$

Let $t = x - a$ to obtain

$$\int_0^\infty (t+a)^{-\lambda}(t+a+b)^\nu t^{\mu-1}\,dt.$$

Now employ 3.197.1 written in the form

$$\int_0^\infty x^{\alpha-1}(x+B)^{-\beta}(x+C)^{-\gamma}\,dx = B^{-\beta}C^{\alpha-\gamma}B(\alpha,\beta-\alpha+\gamma)_2F_1\left[\beta,\alpha;\beta+\gamma;1-C/B\right],$$

with $\alpha = \mu$, $\beta = \lambda$, $\gamma = -\nu$ and $B = a$, $C = a + b$, to get the result.