Solve the Integrations analytically

$$\int_0^\infty u^2 exp(-au^2)du = \frac{1}{4}\sqrt{\frac{\pi}{a^3}}$$

$$\int_0^\infty exp(-au^2)du = \frac{1}{2}\sqrt{\frac{\pi}{a}}$$

And if possible try to read about Gamma function and how to tackle higher order integration like those above. Suggest any other way if you know to evaluate these integrals (you can try exploring python computation too for these integrations)