hence

$$\int_0^\infty x^7 e^{-x^2} dx = \left[\left(\frac{-x^6}{2} + \frac{-3x^4}{2} + (-3)x^2 - 3 \right) e^{-x^2} \right]_0^\infty$$

$$= 0 - (-3) = 3$$

$$Q = \frac{1}{32} \left(\frac{\mu}{2kT} \right)^4 \times 2\pi \times \frac{d^2}{3} \times \left(\frac{4kT}{\mu} \right)^4 \times 3$$

$$= \frac{1}{32} \cdot (2)^4 \times 2\pi \times d^2 = \frac{32}{32} \pi d^2 = \pi d^2 .$$

Q is actually the hard-sphere cross-section in this case !

$$\eta = \frac{5\pi}{32\sqrt{2}} \times \frac{\mu \bar{v}}{Q} = \frac{5\pi}{32\sqrt{2}} \times \mu \times \frac{1}{\pi d^2} \times \left(\frac{8kT}{\pi \mu} \right)^{1/2}$$

$$\eta = \frac{5}{32\sqrt{2}\, d^2} \times 2\sqrt{2} \times \left(\frac{kT \mu^2}{\pi \mu} \right)^{1/2}$$

$$\boxed{\eta = \frac{5}{16\, d^2} \sqrt{\frac{\mu k T}{\pi}}}$$