$$W(\vec{F}) = \int_0^{2} \vec{F}.d\vec{OM}$$

$$\vec{a}(t) = +\frac{2b}{2}\times\frac{2}{2}e^{-\frac{2t}{2}}\vec{u_r} - \frac{2b}{2}e^{-\frac{2t}{2}}\omega\vec{u_\theta} - \frac{2b}{2}e^{-\frac{2t}{2}}\omega\vec{u_\theta} - be^{-\frac{2t}{2}}\omega^2\vec{u_r}$$

$$\vec{a}(t) = \left(\frac{4b}{2^2} - b\omega^2\right)e^{-\frac{2t}{2}}\vec{u_r} - \frac{4b}{2}e^{-\frac{2t}{2}}\vec{u_\theta}$$

$$\text{donc}\quad \vec{F} = m\vec{a} = m\left(\frac{4b}{2^2} - b\omega^2\right)e^{-\frac{2t}{2}}\vec{u_r} - m\frac{4b}{2}e^{-\frac{2t}{2}}\omega\vec{u_\theta}$$

$$\text{et}\quad d\vec{OM} = dr\,\vec{u_r} + r\,d\theta\,\vec{u_\theta} + dz\,\vec{u_z}$$

$$\Rightarrow W(\vec{F}) = \int_0^{2}\left(F_r\,dr + F_\theta\, r\,d\theta + \underbrace{F_z\,dz}_{0}\right)$$

$$W(\vec{F}) = \int_0^{2} m\left(\frac{4b}{2^2} - b\omega^2\right)e^{-\frac{2t}{2}}dr + \int_0^{2} -m\frac{4b}{2}e^{-\frac{2t}{2}}\omega r\,d\theta$$

$$\text{or}\quad r = be^{-\frac{2t}{2}}\quad\text{donc}\quad dr = -\frac{2b}{2}e^{-\frac{2t}{2}}dt$$

$$\text{et}\quad d\theta = \omega\,dt$$

$$\text{donc}\quad W(\vec{F}) = \int_0^{2} m\left(\frac{4b}{2^2} - b\omega^2\right)e^{-\frac{2t}{2}}\left(-\frac{2}{2}be^{-\frac{2t}{2}}\right)dt + \int_0^{2} -m\frac{4b}{2}e^{-\frac{2t}{2}}be^{-\frac{2t}{2}}\omega^2 dt$$

$$W(\vec{F}) = -m\frac{2b}{2}\left(\frac{4b}{2^2} - b\omega^2\right)\int_0^{2} e^{-\frac{4t}{2}}dt - \frac{m4b^2\omega^2}{2}\int_0^{2} e^{-\frac{4t}{2}}dt$$

$$\text{or}\quad \int_0^{2} e^{-\frac{4t}{2}}dt = -\frac{2}{4}\left[e^{-\frac{4t}{2}}\right]_0^{2} = -\frac{2}{4}\left(e^{-\frac{4\cdot 2}{2}} - 1\right) = -\frac{2}{4}\left(e^{-4} - 1\right)$$

$$\Rightarrow W(\vec{F}) = -\frac{2}{4}\left(e^{-4} - 1\right)\times\left\{-m\frac{2b}{2}\left(\frac{4b}{2^2} - b\omega^2\right) - \frac{m4b^2\omega^2}{2}\right\}$$

$$W(\vec{F}) = -\frac{2}{4}\left(e^{-4} - 1\right)\times\frac{4mb^2}{2}\left[-\frac{2}{2} - \frac{\omega}{2}^2\right]$$

$$W(\vec{F}) = \left(e^{-4} - 1\right)mb^2\left(\frac{\omega}{2}^2 + \frac{2}{2^2}\right)$$