5. $y=e^x$, $y=0$, $x=0$, $x=1$, $\rho=kx$

m

$$m=\int_{x=0}^{x=1}\int_{y=0}^{y=e^x}(kx)\,dy\,dx$$

$$m=\int_{x=0}^{x=1}\left[kxy\right]_{y=0}^{y=e^x}dx$$

$$m=k\int_{x=0}^{x=1}x\left[e^x-0\right]dx$$

S	D	±
+	x	e^x
−	1	e^x
+	0	e^x

$$m=k\left[xe^x-e^x\right]_{x=0}^{x=1}$$

$$m=k\left[1\cdot e^1-e^1-\left(0\cdot e^0-e^0\right)\right]$$

$$m=k\left[-(-1)\right]$$

$$\boxed{m=k}$$

M_x

$$M_x=\int_{x=0}^{x=1}\int_{y=0}^{y=e^x}y(kx)\,dy\,dx$$

$$M_x=k\int_{x=0}^{x=1}\left[\tfrac{1}{2}y^2x\right]_{y=0}^{y=e^x}dx$$

$$M_x=\tfrac{1}{2}k\int_{x=0}^{x=1}x\left[(e^x)^2-0^2\right]dx$$

$$M_x=\tfrac{1}{2}k\int_{x=0}^{x=1}xe^{2x}\,dx$$

S	D	±
+	x	e^{2x}
−	1	$\frac{1}{2}e^{2x}$
+	0	$\frac{1}{4}e^{2x}$

$$M_x=\tfrac{1}{2}k\left[\tfrac{1}{2}xe^{2x}-\tfrac{1}{4}e^{2x}\right]_{x=0}^{x=1}$$

$$M_x=\tfrac{1}{2}k\left[\tfrac{1}{2}(1)e^{2(1)}-\tfrac{1}{4}e^{2(1)}-\left(\tfrac{1}{2}(0)e^{2(0)}-\tfrac{1}{4}e^{2(0)}\right)\right]$$

$$M_x=\tfrac{1}{2}k\left[\tfrac{1}{2}e^2-\tfrac{1}{4}e^2+\tfrac{1}{4}(1)\right]$$

$$M_x=\tfrac{1}{2}k\left[\tfrac{2}{4}e^2-\tfrac{1}{4}e^2+\tfrac{1}{4}\right]$$

$$M_x=\tfrac{1}{2}k\left[\tfrac{1}{4}e^2+\tfrac{1}{4}\right]$$

$$M_x=\tfrac{1}{8}k\left(e^2+1\right)$$

M_y

$$M_y=\int_{x=0}^{x=1}\int_{y=0}^{y=e^x}x(kx)\,dy\,dx$$

$$M_y=k\int_{x=0}^{x=1}\left[x^2y\right]_{y=0}^{y=e^x}dx$$

$$M_y=k\int_{x=0}^{x=1}x^2\left[e^x-0\right]dx$$

$$M_y=k\int_{x=0}^{x=1}x^2e^x\,dx$$

S	D	±
+	x^2	e^x
−	$2x$	e^x
+	2	e^x
−	0	e^x

$$M_y=k\left[x^2e^x-2xe^x+2e^x\right]_{x=0}^{x=1}$$

$$M_y=k\left[1^2e^1-2(1)e^1+2e^1-\left(0^2e^0-2(0)e^0+2e^0\right)\right]$$

$$M_y=k\left[e-2e+2e-2\right]$$

$$M_y=k\left[e-2\right]$$

$$(\bar{x},\bar{y})=\left(\frac{M_y}{m},\frac{M_x}{m}\right)=\left(\frac{k(e-2)}{k},\frac{\frac{1}{8}k(e^2+1)}{k}\right)=\boxed{\left(e-2,\tfrac{1}{8}(e^2+1)\right)}$$