```
> restart : with(LinearAlgebra) : with(plots) : with(plottools) : with(inttrans) :
      with(VectorCalculus) : SetCoordinates('cartesian'[x, y, z]) :
> r_t := simplify(VectorField([diff(a·cos(theta)·(1 + cos(theta)), theta$1),
      diff(a·sin(theta)·(1 + cos(theta)), theta$1), 0]))
```

$$r\_t := (a\sin(\theta)\ (-1-2\cos(\theta)))\bar{e}_x + ((2\cos(\theta)^2+\cos(\theta)-1)\ a)\bar{e}_y + (0)\bar{e}_z \quad (1)$$

```
> ds := simplify(sqrt((a sin(θ) (−1 − 2 cos(θ)))^2 + ((2 cos(θ)^2 + cos(θ)
      − 1) a)^2))
```

$$ds := \sqrt{2}\sqrt{a^2\ (1+\cos(\theta))} \quad (2)$$

```
> M := int(ds, theta = 0..Pi)
```

$$M := 4\,a\,\mathrm{csgn}(a) \quad (3)$$

```
> M_x := 1/M ·int(ds·(a·cos(theta)·(1 + cos(theta))), theta = 0..Pi)
```

$$M\_x := \frac{4\,a}{5} \quad (4)$$

```
> M_y := 1/M ·int(ds·(a·sin(theta)·(1 + cos(theta))), theta = 0..Pi)
```

$$M\_y := \frac{4\,a}{5} \quad (5)$$

```
>
```