The Center of Mass of a Lamina Reproductions by James Pate Williams, Jr.

Applications Of Double Integrals (Illustrated w/ Examples!) (calcworkshop.com)

3.7: Moments and Centers of Mass - Mathematics LibreTexts

Let the density function be given by:

$$\rho(x,y) = \frac{1}{1+y}$$

The moment of mass with respect to x is:

$$M_x = \int_0^1 \int_0^1 \frac{y}{1+y} dxdy$$

Similarly, the moment of mass with respect to y is:

$$M_y = \int_0^1 \int_0^1 \frac{x}{1+y} dxdy$$

The mass is calculated using the formula:

$$M = \int_0^1 \int_0^1 \frac{1}{1+y} dxdy$$

Using a computer two-dimensional cubature application, we get the following results:

```
a = 0
b = 1
Mass = 0.693147
Mass Moment x = 0.346574
Mass Moment y = 0.306853
Center of Mass x = 0.5
Center of Mass y = 0.442695
```

Let the mass density be:

$$\rho(x,y) = k(x^2 + y^2)$$

And the moments:

$$M_x = k \int_0^2 \int_0^1 y(x^2 + y^2) dxdy$$

$$M_y = k \int_0^2 \int_0^1 x(x^2 + y^2) dxdy$$

$$M = k \int_0^2 \int_0^1 (x^2 + y^2) dx dy$$

Choose k = 1 then we calculate:

```
k = 1
Mass 2 = 0.666667
Mass Moment x 2 = 0.416667
Mass Moment y 2 = 0.416667
Center of Mass x 2 = 0.625
Center of Mass y 2 = 0.625
```