1. Calculate the fluid force of a plate in the shape of the region shown in the figure below. The surface of the mystery fluid of density \( \rho \) is at \( y = 1 \).

\[
\text{force} = \int_0^1 (1-y)e^y \, dy
\]

\[
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\]

\[
u = 1 - y, \quad d\nu = e^y \, dy,
\]

\[
u = e^y
\]

\[
= \int_0^1 \left[ (1-y)e^y \right]_0^1 - \int_0^1 e^y \, dy
\]

\[
= \int_0^1 \left[ -1 + e^y \right]_0^1 = \int_0^1 (e - 2)
\]

2. Find parametric equations, \( x(t) \) and \( y(t) \), for the line segment from \((3, 2)\) to \((5, -2)\). Include the domain of \( t \).

\[
x = 3 + 2t, \quad 0 \leq t \leq 1
\]

\[
y = 2 - 4t
\]

3. Find parametric equations, \( x(t) \) and \( y(t) \), for the circle with center \((1, -2)\) and radius \(3\). Include the domain of \( t \).

\[
x = 1 + 3 \cos t, \quad 0 \leq t \leq 2\pi
\]

\[
y = -2 + 3 \sin t
\]

4. We can change the ‘speed’ of a parametric curve by scaling the parameter. For example, replacing \( t \) with \( 2t \) will increase the speed by a factor of two, i.e. the curve will be traced out twice as fast. We can change the direction a curve travels by similarly altering the parameter.

A cycloid generated by a circle of radius 1 has a parameterization given by

\[
x(t) = t - \sin(t), \quad y(t) = 1 - \cos(t).
\]

Find a parameterization of a cycloid generated by a circle of radius 1 that goes ‘backwards.’

\[
x = -t - \sin(-t), \quad y = 1 - \cos(-t)
\]