1. Use Green’s theorem to replace the line integral \( \oint_C (y - \sin(y) \cos(y))dx + 2x \sin^2(y)dy \) with a double integral, where \( C \) is the counterclockwise path around the region bounded by \( x = -1, x = 2, y = 4 - x^2, \) and \( y = x - 2. \)

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2. Evaluate \( \oint_C (x^2 - y)dx + (x - y^2)dy \) where \( C \) is the counterclockwise path around the region bounded by \( y = x^2 \) and \( y = 6x + 7. \)

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3. Find the area of the region enclosed by the parametric equation

\[
p(\theta) = (\cos(\theta) - \cos^2(\theta), \sin(\theta) - \cos(\theta) \sin(\theta)) \quad \text{for} \quad 0 \leq \theta \leq 2\pi
\]

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4. Evaluate \( \int_C -e^y \sin(x)dx + e^y \cos(x)dy + dz \) over the curve \( C \) where \( C \) is the straight line from the point \((0, 0, 0)\) to \((\pi, \pi, 1)\).
5. Let \( F(x, y, z) = (x + y, y + z, x + z) \) be a vector valued function.

(a) Compute the divergence of the vector field.

(b) Compute the curl of the vector field.

(c) Is the vector field conservative?

6. Consider the integral \( \int_C F \cdot ds \) in two dimensions with \( F(x, y) = (F_1(x, y), F_2(x, y)) \).

(a) What conditions on the curve \( C \) and/or the vector field \( F \) do you need to use the fundamental theorem for line integrals to evaluate the integral.

(b) What conditions on the curve \( C \) and/or the vector field \( F \) do you need to use Green’s Theorem to evaluate the integral.