Calculus 3 Workbook

Green's theorem

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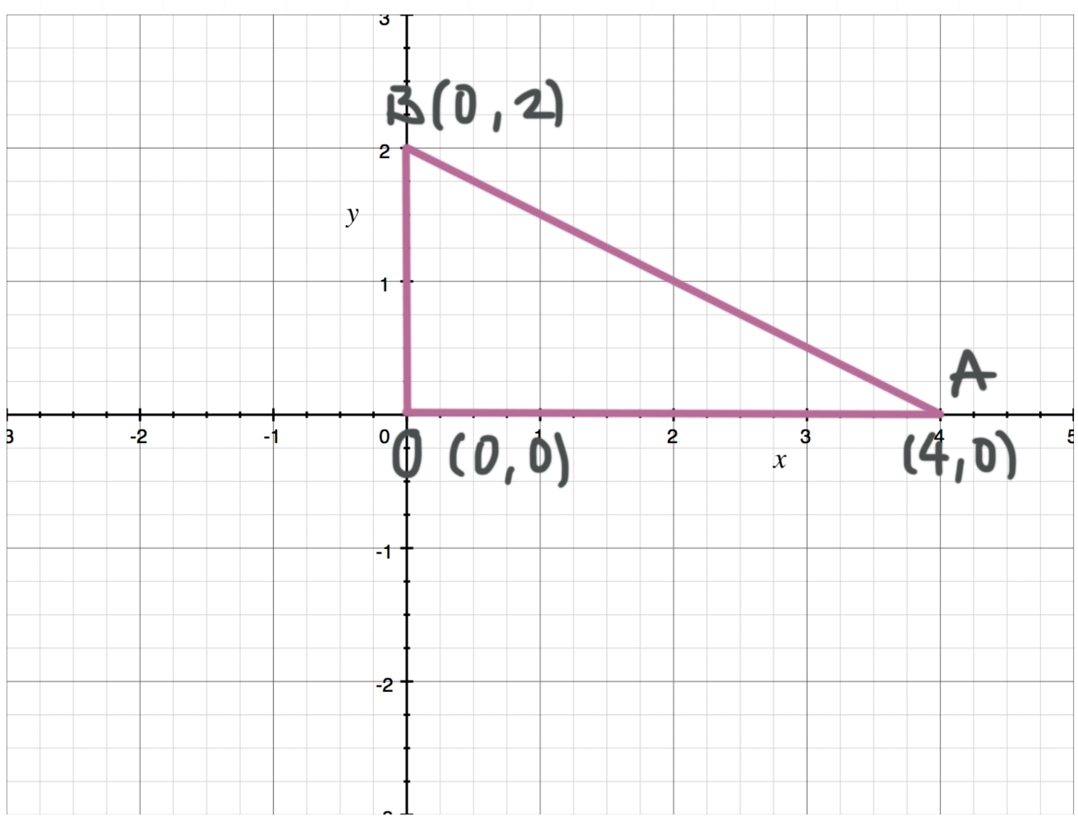
GREEN'S THEOREM FOR ONE REGION

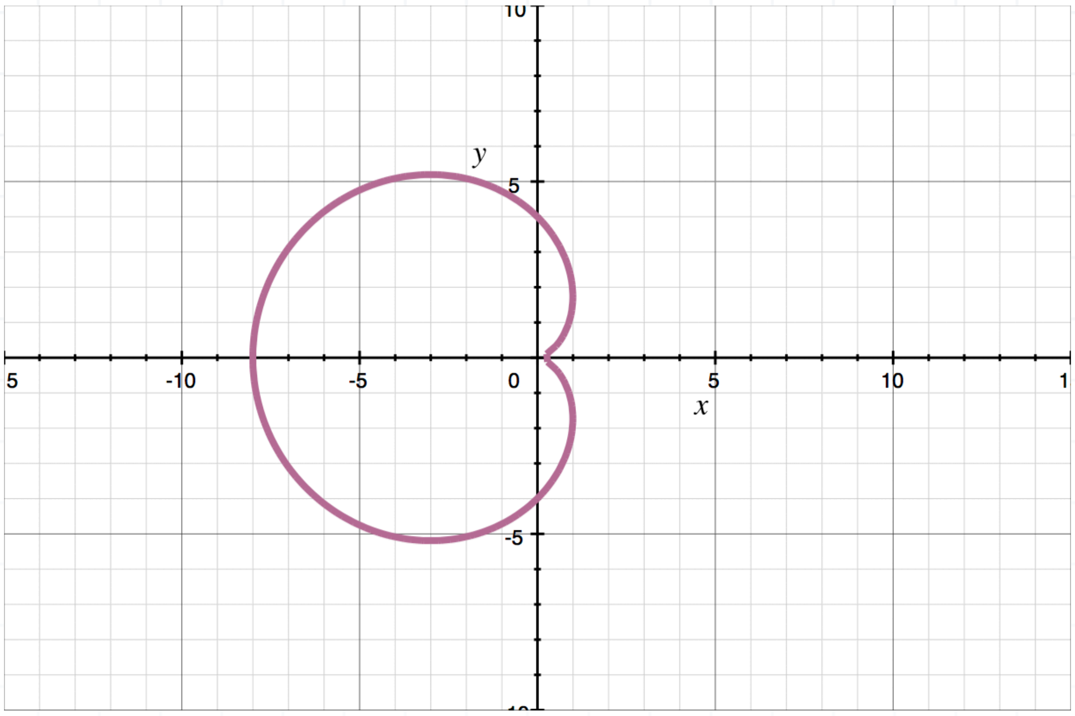
1. Use Green's theorem to calculate the line integral of the vector field $\vec{F}(x,y)$ over the circle with the center at the origin and radius 4.

$$\vec{F}(x,y) = \left\langle \ln(x^2+y^2+20) - 2y - 3x, \sqrt{x^2+y^2+9} \right\rangle$$

2. Use Green's theorem to calculate the line integral of the vector field $\vec{F}(x,y) = \langle y(y^2+\sin x), y^2-\cos x \rangle$ over the triangle OAB, where $O(0,0)$, $A(4,0)$, and $B(0,2)$.

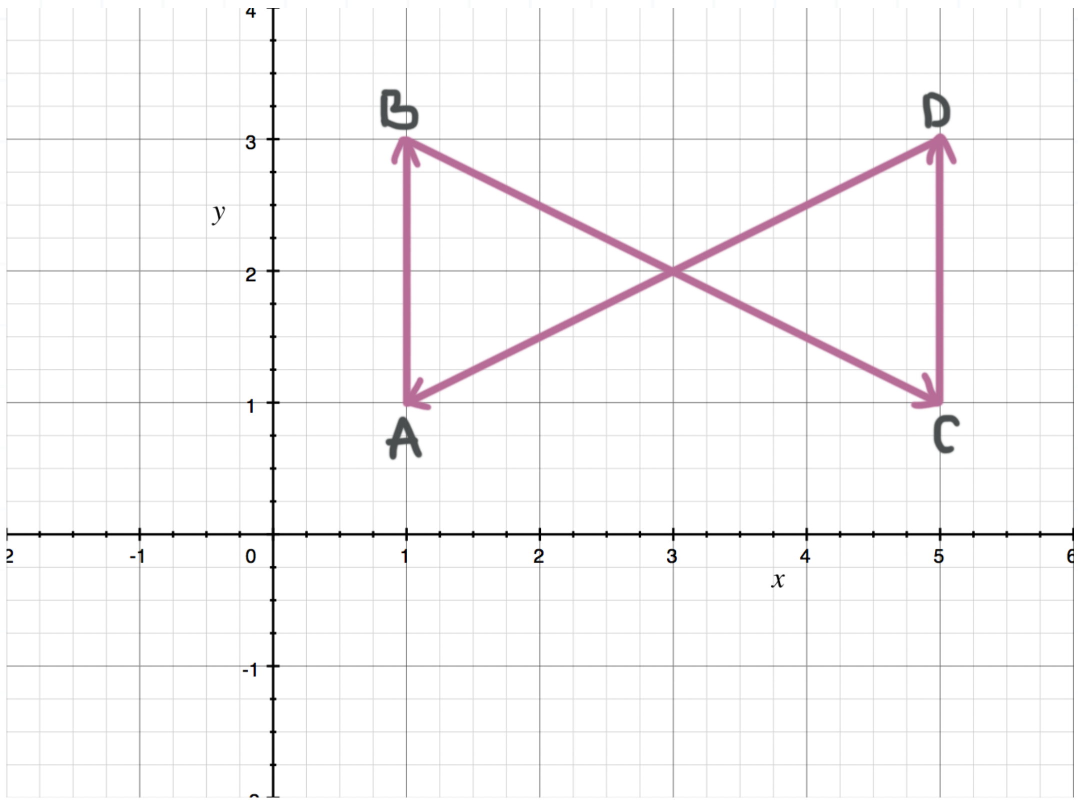


3. Use Green's theorem to calculate the line integral of the vector field $\vec{F}(x,y) = \langle x^3-y^3, x^3+y^3 \rangle$ over the cardioid $(x^2+y^2)^2 + 8x(x^2+y^2) - 16y^2 = 0$.


10
y
5
5
-10
-5
0
5
10
1
x
-5

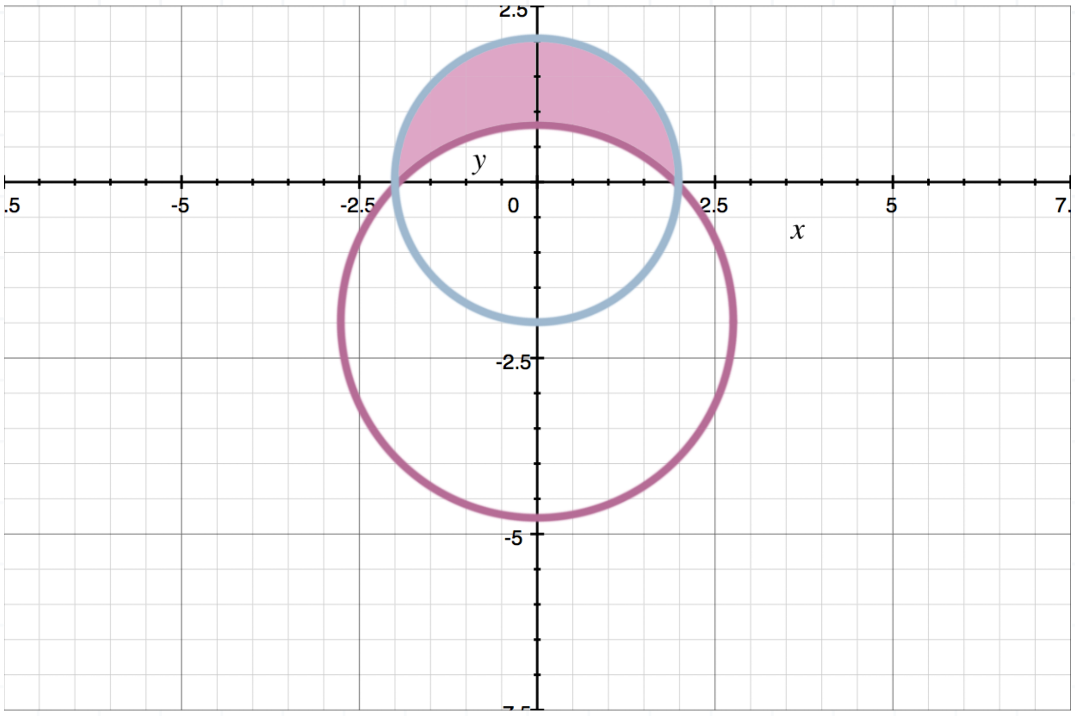
GREEN'S THEOREM FOR TWO REGIONS

■ 1. Use Green's theorem to calculate the line integral of the vector field $\vec{F}(x, y) = \langle x^2, x^3y \rangle$ over the piecewise linear closed curve $ABCDA$, where $A(1,1)$, $B(1,3)$, $C(5,1)$, and $D(5,3)$.

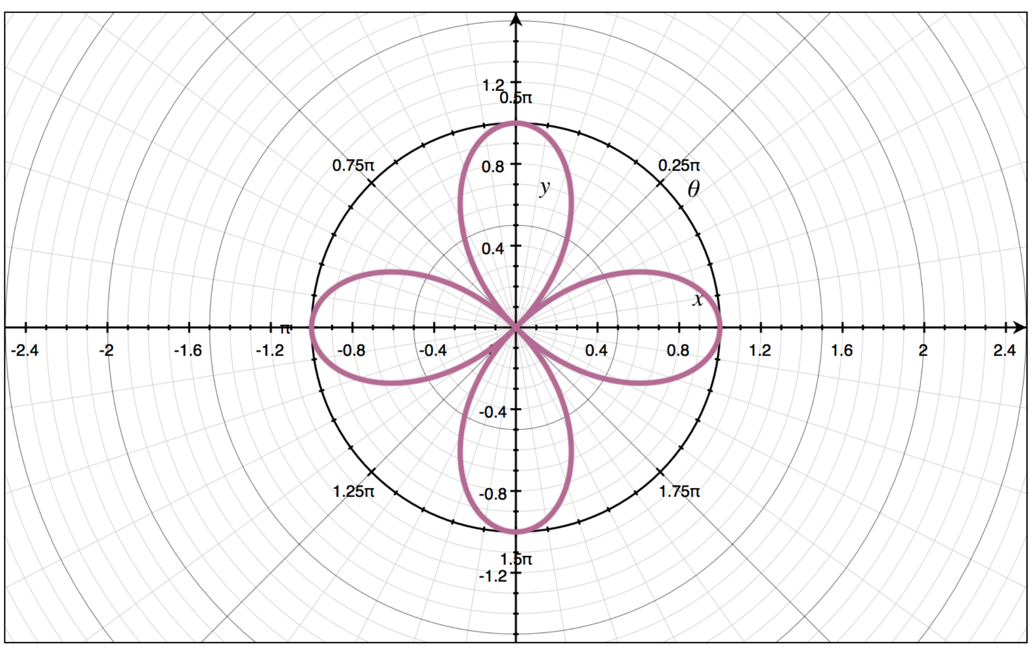


■ 2. Use Green's theorem (in reverse order) to calculate the double integral over the region D inside the circle $C_1: x^2 + y^2 = 4$, but outside the circle $C_2: x^2 + (y+2)^2 = 8$.

$$\iint_D 3x^2 \, dA$$



■ 3. Use Green's theorem to calculate the line integral of the vector field $\overrightarrow{F}(x,y) = \langle e^{x^2} - 2y, y^2 + 2x \rangle$ over the four-petaled rose $r = \cos 2\phi$.



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