Name ____________________

Homework 8

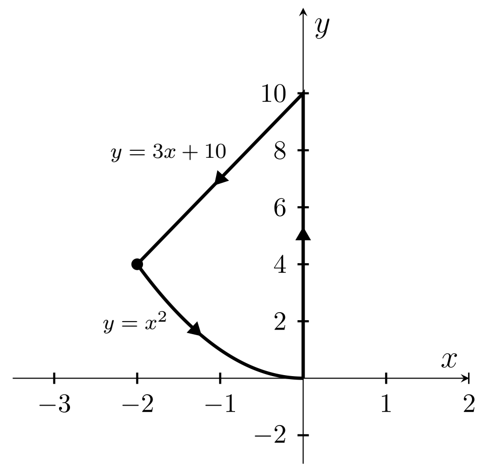
Sections 18.3–19.1

1. (4) Use the Fundamental Theorem of Calculus for Line Integrals to compute $\int_C \vec{F} \cdot d\vec{r}$ where

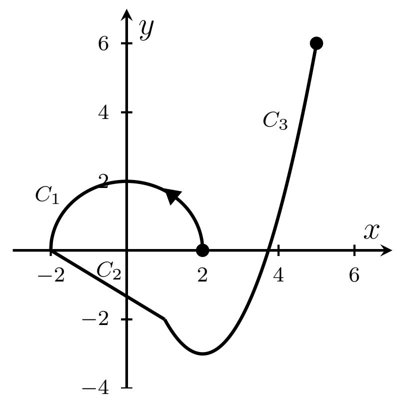
$$\vec{F}(x, y, z) = (yz + 2x)\vec{i} + (xz - 2y)\vec{j} + (xy + 2z)\vec{k}$$

and $C$ is the path from $(1, 8, -1)$ to $(7, 4, 3)$ given by $x(t) = 3t + 1$, $y(t) = 6 + 2\cos\left(\frac{\pi}{2}t\right)$, $z(t) = t^2 - 1$, for $0 \leq t \leq 2$.

2. (5) Compute $\oint_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = (4xy + 8x^2y - 2xy^2)\,\vec{i} + \left(6x^3 - \tan(\frac{y}{8}) + 2x^2\right)\vec{j}$ and $C$ is the oriented curve shown below.

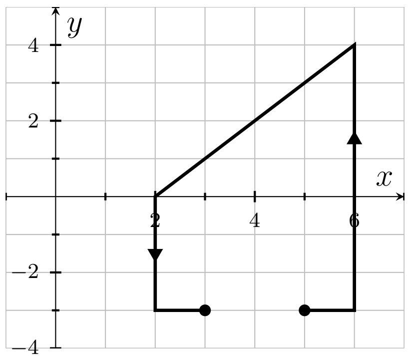


3. (5) Consider the vector field $\vec{F} = \left(\frac{2xy - 2xy^2}{(1+x^2)^2} + \frac{8}{13}\right)\vec{i} + \left(\frac{2y-1}{1+x^2} + 2y\right)\vec{j}$. Determine $\int_C \vec{F} \cdot d\vec{r}$, where $C$ is the path $C_1 + C_2 + C_3$ from $(2,0)$ to $(5,6)$ shown.




$C_1$ is a semicircle.
$C_2$ is a line segment.
$C_3$ is a portion of the graph of $y = (x-2)^2 - 3$.

4. (6) Integrate the vector field $\vec{G} = (x^2y + 5xy^2 + 2y)\,\vec{i} + \left(\frac{1}{3}x^3 + 8x + 5x^2y\right)\vec{j}$ around the oriented curve, $C$, shown below.



5. (3ea) Consider the vector field $\vec{G} = (4+x)\vec{i} - 4xy\vec{j} + (x^2 - z)\vec{k}$.

(a) Determine the flux of $\vec{G}$ through the disk, $D$, of radius 5 in the $x = 2$ plane, centered at $(2, 1, 7)$, oriented toward the $yz$-plane.

(b) Determine the flux of $\vec{G}$ through the rectangle, $R$, with vertices $(-1, 1, 2)$ $(-1, 3, 2)$ $(5, 3, 2)$ and $(5, 1, 2)$, oriented upward.