Name ____________________

Homework 15

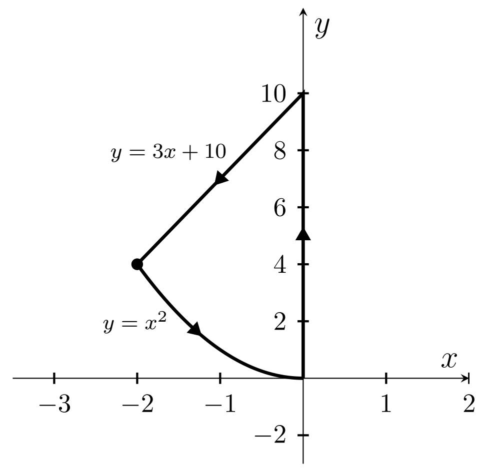
Sections 18.3 & 18.4

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

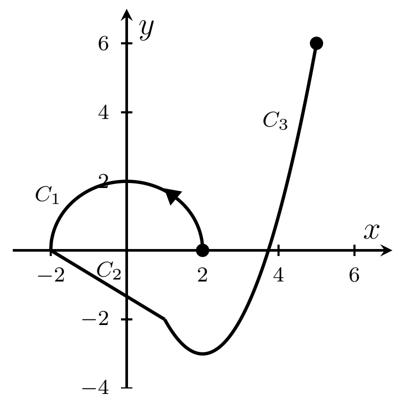
$$\vec{F}(x, y, z) = (yz + 2x)\vec{i} + (xz - 2y)\vec{j} + (xy + 2z)\vec{k}$$

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 $\vec{F} = (4xy + 8x^2y - 2xy^2)\,\vec{\imath} + \left(6x^3 - \tan(\frac{y}{8}) + 2x^2\right)\vec{\jmath}$ and C is the oriented curve shown below.



3. (5) Consider the vector field $\vec{F} = \left(\dfrac{2xy - 2xy^2}{(1+x^2)^2} + \dfrac{8}{13}\right)\vec{i} + \left(\dfrac{2y-1}{1+x^2} + 2y\right)\vec{j}$. 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 $\vec{G} = (xy^2 + x + 6y)\,\vec{i} + \left(\frac{3}{2}x^2 + 2x + x^2 y\right)\vec{j}$ around the oriented curve, C, shown below.