

Physics 3513, Midterm II

- (1) Find the volume of the solid generated when the curve $y = x^2 - x^3$, $0 \leq x \leq 1$, is revolved around the x axis.
- (2) Verify that the function $\mathbf{F} = (e^z + ye^x)\mathbf{i} + (e^x + ze^y)\mathbf{j} + (e^y + xe^z)\mathbf{k}$ is conservative, and find its scalar potential.
- (3) Solve $y'' + 10y' + 9y = 9e^{-10x}$.
- (4) Find $\nabla(\mathbf{c}\mathbf{r})$, where $\mathbf{r} = (x, y, z)$ and \mathbf{c} is a constant vector.
- (5) Using Green's theorem $\oint_C P dx + Q dy = \iint_S \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dx dy$, calculate $\oint_C -2y \sin^2 x dx + \sin x \cos x dy$ where C is the contour shown below.

