1) Evaluate the line integral of the scalar-valued function $f(x,y) = \frac{1}{16}(x-1)y^2$ along the smooth curve C given by the vector function $\mathbf{r} = (1+3t)\mathbf{i} + 4t\,\mathbf{j}$ where $0 \leq t \leq 1$.

(8 points)

2) Consider the vector field $\mathbf{F}(x,y) = \sin y\ \mathbf{i} + x\cos y\ \mathbf{j}$ and the smooth curve C given by the vector function $\mathbf{r}(t) = \sin t\ \mathbf{i} + t\,\mathbf{j}$ where $\frac{\pi}{6} \leq t \leq \frac{\pi}{2}$.

a) Determine whether or not vector field $\mathbf{F}$ is conservative.

(4 points)

b) Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$ directly if the vector field is not conservative, but use the fundamental theorem of calculus for the line integral if it is conservative.

(8 points)