MA 213 Worksheet #24

Section 16.2 & 16.3
11/27/18

1 Evaluate the line integral, where C is the given curve.
16.2.1 $\int_C y ds, \quad C: x = t^2, y = 2t, 0 \leq t \leq 3.$
16.2.10 $\int_C y^2 z ds, \quad C$ is the line segment from $(3, 1, 2)$ to $(1, 2, 5)$.
16.2.14 $\int_C y dx + z dy + x dz, \quad C: x = \sqrt{t}, y = t, z = t^2, 1 \leq t \leq 4.$

2 Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C is the given curve.
16.2.19 $\mathbf{F}(x, y) = xy^2\mathbf{i} - x^2\mathbf{j}, \quad \mathbf{r}(t) = t^3\mathbf{i} + t^2\mathbf{j},\ 0 \leq t \leq 1.$
16.2.22 $\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + xy\mathbf{k}, \quad \mathbf{r}(t) = \cos t\mathbf{i} + \sin t\mathbf{j} + t\mathbf{k},\ 0 \leq t \leq \pi.$

3 *16.2.39* Find the work done by the force field $\mathbf{F}(x, y) = x\mathbf{i} + (y + 2)\mathbf{j}$ in moving an object along an arch of the cycloid: $\mathbf{r}(t) = (t - \sin t)\mathbf{i} + (1 - \cos t)\mathbf{j}, \quad 0 \leq t \leq 2\pi.$

4 Determine whether or not $\mathbf{F}$ is a conservative vector field.
16.3.3 $\mathbf{F}(x, y) = (xy + y^2)\mathbf{i} + (x^2 + 2xy)\mathbf{j}.$
14.3.7 $\mathbf{F}(x, y) = (ye^x + \sin y)\mathbf{i} + (e^x + x \cos y)\mathbf{j}$

5 Find a function f such that $\mathbf{F} = \nabla f$ and evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ along the given curve C.
16.3.12 $\mathbf{F}(x, y) = (3 + 2xy^2)\mathbf{i} + 2x^2y\mathbf{j}, C$ is the arc of the hyperbola $y = 1/x$ from $(1, 1)$ to $(4, \frac{1}{4})$.
16.3.15 $\mathbf{F}(x, y, z) = yz\mathbf{i} + xz\mathbf{j} + (xy + 2z)\mathbf{k}, C$ is the line segment from $(1, 0, -2)$ to $(4, 6, 3)$.

6 Show the line integral is independent of path and evaluate the integral.
16.3.19 $\int_C 2xe^{-y} dx + (2y - x^2e^{-y})$, where C is any path from $(1, 0)$ to (2,1).

7 *16.3.24* Find the work done by the force field $\mathbf{F}(x, y) = (2x + y)\mathbf{i} + x\mathbf{j}$ in moving an object from $P(1, 1)$ to $Q(4, 3)$.