MATH 3132 Tutorial 5

1. Evaluate the line integral

$$\oint_C [(2xe^y + y^3)\hat{\mathbf{i}} + (x^2e^y + z)\hat{\mathbf{j}} + xz^3\hat{\mathbf{k}}] \cdot d\mathbf{r}$$

once around the curve C: $z = x^2 + y^2$, $z = 10 - 4x^2 - 4y^2$ directed counterclockwise as viewed from the origin.

2. Evaluate the line integral

$$\oint_C (x\hat{\mathbf{i}} + y^2\hat{\mathbf{j}} - y^3\hat{\mathbf{k}}) \cdot d\mathbf{r}$$

where C is the edge of the triangle bounding that part of $2x+y+z = 2$ in the first octant, directed clockwise as viewed from the origin.

3. Evaluate the line integral

$$\oint_C z^3\,dx + x^2y\,dy + 2y\,dz$$

where C is the curve $x^2 + y^2 + z^2 = 4$, $x = 1$, directed counterclockwise as viewed from the origin.

4. Evaluate the line integral

$$\oint_C 4x^3e^y\,dx + (x^3 + x^4e^y)\,dy + (xy + z)\,dz$$

where C is the curve $x^2 + y^2 + z^2 = 4$, $z = \sqrt{x^2 + y^2}$, directed clockwise as viewed from the origin.

5. Evaluate the line integral

$$\oint_C 3y\,dx + yz^2\,dy + y^2z\,dz$$

where C is the curve $x^2 + y^2 = 4$, $x + y + z = 1$, directed counterclockwise as viewed from above.

6. Evaluate the line integral

$$\oint_C (y\hat{\mathbf{i}} + 2yz\hat{\mathbf{j}} + x^2\hat{\mathbf{k}}) \cdot d\mathbf{r}$$

where C is the curve $x = \cos t$, $y = \sin t$, $z = \cos t \sin t$, $-\pi \le t \le \pi$.

7. Evaluate the line integral

$$\oint_C [(2y^3/3)\hat{\mathbf{i}} + 2xy^2\hat{\mathbf{j}} + xz\hat{\mathbf{k}}] \cdot d\mathbf{r}$$

where C is the curve $x = 2\cos t$, $y = 3\sin t$, $z = 4\cos^2 t - 9\sin^2 t$, $-\pi \le t \le \pi$.

Answers: **1.** 3π **2.** $-8/3$ **3.** -6π **4.** 3π **5.** -12π **6.** 0 **7.** 0