Sample Test 1 MATH3132

Time: 75 Minutes

1. Evaluate the line integral

$$\int_C \mathbf{F} \cdot d\mathbf{r}$$

where $\mathbf{F} = x\hat{\mathbf{i}} + y\hat{\mathbf{j}} + z\hat{\mathbf{k}}$ and C is that part of the curve $z = x^2$, $x + y + z = 1$ from $(-1, 1, 1)$ to $(2, -5, 4)$.

Answer: 21

2. Evaluate the line integral

$$\oint_C (y^2 e^x + x)dx + (2ye^x + xy)dy$$

where C is the triangle with vertices $(1, 1)$, $(2, 1)$, and $(2, 2)$.

Answer: 2/3

3. Evaluate the surface integral

$$\iint_S xz^3 \, dS$$

where S is that part of the surface $z = \sqrt{1 - x^2 - y^2}$ in the first octant.

Answer: 2/15

5. Evaluate

$$\oiint_S \mathbf{F} \cdot \hat{\mathbf{n}} \, dS$$

where $\mathbf{F} = xy^2\hat{\mathbf{i}} + x^2y\hat{\mathbf{j}} + z\hat{\mathbf{k}}$, S is the surface that encloses the region bounded by the surfaces $x^2 + y^2 = 4$, $z = 1$, and $z = 4$, and $\hat{\mathbf{n}}$ is the unit outward pointing normal to S.

Answer: 36π

6. Evaluate the line integral

$$\oint_C (y^3 + z) \, dx - x^3 \, dy + xyz \, dz$$

where C is the curve $x^2 + y^2 + z^2 = 5$, $z = 1$ directed clockwise as viewed from above the curve.

Answer: 24π