

Sample Test 1 MATH3132

Time: 75 Minutes

Evaluate any two of the line integrals in Questions 1–3. If you attempt all three, clearly indicate which two you wish marked.

1. $\int_C x^2 y z \, ds$ where C is the quarter circle $x^2 + y^2 = 4$, $z = 3$ from $(2, 0, 3)$ to $(0, 2, 3)$.

Answer: 16

2. $\int_C (3x^2 y + z) dx + (x^3 - 1) dy + x dz$ where C is the straight line from $(1, -1, 2)$ to $(3, 2, -1)$.

Answer: 47

3. $\oint_C (x^3 y^2 - 1) dx + (xy + y) dy$ where C is the curve bounding the area enclosed by $y = x^2$, $y = 4$.

Answer: $-128/5$

4. Set up, but do not evaluate, a double iterated integral representing the surface integral

$$\iint_S (x + y + z) dS$$

where S is that part of the surface $z = 1 - x^2$ in the first octant cut off by $y = 0$ and $y = 2$.

Answer: $\int_0^1 \int_0^2 (x + y + 1 - x^2) \sqrt{1 + 4x^2} \, dy \, dx$

5. Evaluate

$$\oiint_S [(x + y^2)\hat{\mathbf{i}} - (4y + xz)\hat{\mathbf{j}} + (xy + z)\hat{\mathbf{k}}] \cdot \hat{\mathbf{n}} \, dS$$

where S is the surface $x^2 + y^2 + z^2 = 4$ and $\hat{\mathbf{n}}$ is the unit outward pointing normal to S .

Answer: $-64\pi/3$

6. Evaluate the line integral

$$\oint_C y^3 z \, dx - x^3 z \, dy + 4 \, dz$$

where C is the curve $z = 2 + x^2 + y^2$, $z = 5$ directed clockwise as viewed from the point $(0, 0, 7)$.

Answer: $135\pi/2$