

Fake Quiz 2 Calc 3 11/16/2021

This is a fake quiz, this is *only* a fake quiz. In the event of an actual quiz, you'd have been given fair warning. Repeat: This is *only* a fake quiz.

1. Compute $\int_C (x^2 + y^2) dx - x dy$ along the quarter circle from (1,0) to (0,1).

Integrate the long way to get $-1 - \pi/4$.

2. Evaluate $\iint_S \nabla \times \mathbf{F} \cdot \mathbf{n} d\sigma$ for the hemisphere $S: x^2 + y^2 + z^2 = 9, z \geq 0$ and the field $\mathbf{F} = y\mathbf{i} - x\mathbf{j}$.

Use Stokes' Theorem to get -18π .

3. Evaluate $\int (\sin y \sinh x + \cos y \cosh x) dx + (\cos y \cosh x - \sin y \sinh x) dy$ where C is the line segment from (1,0) to $(2, \pi/2)$.

Integrate using the Fundamental Theorem for Line Integrals (the potential function is $f = \sin y \cosh x + \cos y \sinh x$) to get $\cosh 2 - \sinh 1$.

4. Evaluate $\iint_S \mathbf{F} \cdot \mathbf{n} dS$, where $\mathbf{F}(x,y,z) = 4x\mathbf{i} - 3y\mathbf{j} + 7z\mathbf{k}$ and S is the surface of the cube bounded by the coordinate planes and the planes $x = 1, y = 1,$ and $z = 1$.

Integrate using the Divergence Theorem to get 8.

5. Evaluate $\iint_S \mathbf{F} \cdot \mathbf{n} dS$ where $\mathbf{F}(x,y,z) = x\mathbf{i} + y\mathbf{j} + 2z\mathbf{k}$ and S is the portion of the cone $z^2 = x^2 + y^2$ between the planes $z = 1$ and $z = 2$, oriented upwards.

Integrate the long way to get $14\pi/3$.

6. Evaluate $\int_C (x^2 - y) dx + x dy$, where C is the circle $x^2 + y^2 = 4$ with counterclockwise orientation.

Use Green's Theorem to get 8π .

7. Evaluate $\iint_S \langle x^3, x^2 y, xy \rangle \cdot d\mathbf{S}$, where S is the surface of the solid bounded by $z = 4 - x^2, y + z = 5, z = 0,$ and $y = 0$.

Use the Divergence Theorem to get $4608/35$.

8. Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F}(x,y,z) = y\mathbf{i} + z\mathbf{j} - x\mathbf{k}$ and C is the line segment from (1,1,1) to (-3,2,0).

Integrate the long way to get $-13/2$.

9. Compute $\int_C \left\langle \ln(1+y), -\frac{xy}{1+y} \right\rangle \cdot d\mathbf{r}$ where C is the triangle with vertices (0,0), (2,0), and (0,4).

Use Green's Theorem to get -4 .

10. Evaluate $\int_{(0,1)}^{(\pi,-1)} y \sin x \, dx - \cos x \, dy$.

Use the Fundamental Theorem for Line Integrals (the potential function is $f = -y \cos x$) to get 0 .

11. Compute $\iint_S \mathbf{F} \cdot \mathbf{n} \, dS$ where $\mathbf{F}(x,y,z) = 2y \mathbf{j} + \mathbf{k}$ and S is the portion of the paraboloid $z = x^2 + y^2$ below the plane $z = 4$ with positive orientation.

Use the long way to get -12π .

12. Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F}(x,y,z) = \langle 4x, 7y, -3z \rangle$ and C is the boundary of the first-octant portion of a sphere with radius 5 (centered at the origin).

Use Stokes' Theorem to conclude that, since $\text{curl } \mathbf{F}$ is 0 , the surface integral (and hence the line integral) is 0 .