Unit 3 - Week 2

Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

Line integral

Suppose $\phi = 2xyz^2$, $\vec{F} = xy\hat{x} - z\hat{y} + x^2\hat{z}$, and C is a curve $x = t^2, y = 2t, z = t^3$ from $t = 0$ to $t = 1$

1) The integral $\int_c \phi \, d\vec{r}$ evaluates to *3 points*

- $\frac{8}{11}\hat{x} + \frac{4}{5}\hat{y} + \frac{1}{2}\hat{z}$
- $\frac{8}{11}\hat{x} + \frac{4}{5}\hat{y} + \hat{z}$
- $\frac{8}{11}\hat{x} - \frac{4}{5}\hat{y} + \hat{z}$
- $\frac{8}{11}\hat{x} - \frac{4}{5}\hat{y} + \frac{1}{2}\hat{z}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{8}{11}\hat{x} + \frac{4}{5}\hat{y} + \hat{z}$

2) The integral $\int_c \vec{F} \times d\vec{r}$ evaluates to *4 points*

- $\frac{9}{10}\hat{x} - \frac{2}{3}\hat{y} + \frac{7}{5}\hat{z}$
- $-\frac{9}{10}\hat{x} - \frac{2}{3}\hat{y} - \frac{7}{5}\hat{z}$
- $-\frac{9}{10}\hat{x} - \frac{2}{3}\hat{y} + \frac{7}{5}\hat{z}$
- $-\frac{9}{10}\hat{x} + \frac{2}{3}\hat{y} + \frac{7}{5}\hat{z}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$-\frac{9}{10}\hat{x} - \frac{2}{3}\hat{y} + \frac{7}{5}\hat{z}$

3) **Surface integral** *8 points*

Suppose $\vec{A} = 18z\hat{x} - 12\hat{y} + 3y\hat{z}$ and S is the part of the plane $2x + 3y + 6z = 12$ located in the first octant.
$\int_S \vec{A}.d\vec{a}$ ($d\vec{a}$ is the area element) becomes

- 24
- 19
- 14
- 16

No, the answer is incorrect.
Score: 0

Accepted Answers:
24

4) **Volume integral** *6 points*

A volume V is bounded by the surfaces $x = 0$, $y = 0$, $y = 6$, $z = x^2$, $z = 4$. The volume integral $\int_V \vec{F} dV$ for $\vec{F} = 2xz\hat{x} - x\hat{y} + y^2\hat{z}$ is

- $125\hat{x} - 24\hat{y} + 384\hat{z}$
- $128\hat{x} + 24\hat{y} + 384\hat{z}$
- $125\hat{x} + 24\hat{y} + 384\hat{z}$
- $128\hat{x} - 24\hat{y} + 384\hat{z}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$128\hat{x} - 24\hat{y} + 384\hat{z}$

5) **Divergence theorem** *8 points*

A fluid of density $\rho(x, y, z, t)$ moves with velocity $\vec{v}(x, y, z, t)$. The current density $\vec{J}$ is given by $\vec{J} = \rho\vec{v}$. If there are no sources or sinks, applying divergence theorem the relation you find between $\vec{\nabla}.\vec{J}$ and $\frac{\partial \rho}{\partial t}$ is

- $\vec{\nabla}.\vec{J} = \frac{\partial \rho}{\partial t}$
- $\vec{\nabla}.\vec{J} = -\frac{\partial \rho}{\partial t}$
- $\vec{\nabla}.\vec{J} = \frac{1}{2}\frac{\partial \rho}{\partial t}$
- $\vec{\nabla}.\vec{J} = \frac{1}{2}\frac{\partial \rho}{\partial t} v$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\vec{\nabla}.\vec{J} = -\frac{\partial \rho}{\partial t}$

6) **Stokes' theorem** *5 points*

Let $x = cost$, $y = sint, z = 0$, $0 \leq t < 2\pi$ be the parametric equation of a line C. For a $\vec{A} = (2x - y)\hat{x} - yz^2\hat{y} - y^2 z\hat{z}$, the surface integral $\int_S(\vec{\nabla} \times \vec{A}).d\vec{a}$ over any surface S enclosed by the line C becomes

- 2π
- -2π
- π
- 4π

No, the answer is incorrect.
Score: 0

Accepted Answers:
π