18MAB102T - Surprise Test 2 - May 31

* Required

Answer ALL Questions

Each question carries ONE mark.

1 *

If $\varphi\,(x,y,z) = x^2 + y^2 + z^2$, then $\nabla\varphi$ at $(1,1,1) =$

(A) $2\,\vec{i} + 2\,\vec{j} + 2\,\vec{k}$	(B) $2\,\vec{i} - 2\,\vec{j} + \vec{k}$
(C) $\vec{i} + \vec{j} + \vec{k}$	(D) $2\,\vec{i} - 2\,\vec{j} - 2\,\vec{k}$

- (selected) A
- B
- C
- D

2 *

The maximum value of the directional derivative is given by

(A) $\|\nabla \varphi\|$	(B) curl φ
(C) grad φ	(D) $\|\nabla \times \varphi\|$

- (x) A
- ( ) B
- ( ) C
- ( ) D

3 *

Angle between two surfaces $\varphi_1 = C_1$ and $\varphi_2 = C_2$ is given by

(A) $\sin\theta = \frac{\nabla\varphi_1 \bullet \nabla\varphi_2}{\|\nabla\varphi_1\|\,\|\nabla\varphi_2\|}$	(B) $\cos\theta = \frac{\nabla\varphi_1 \bullet \nabla\varphi_2}{\|\nabla\varphi_1\|\,\|\nabla\varphi_2\|}$
(C) $\tan\theta = \frac{\nabla\varphi_1 \bullet \nabla\varphi_2}{\|\nabla\varphi_1\|\,\|\nabla\varphi_2\|}$	(D) $\tan\theta = \frac{\nabla\varphi_1 \times \nabla\varphi_2}{\|\nabla\varphi_1\|\,\|\nabla\varphi_2\|}$

- ( ) A
- (x) B
- ( ) C
- ( ) D

4 *

The condition for a vector $\vec{r}$ to be solenoidal is

(A) $div\ \vec{r} = 0$	(B) $curl\ \vec{r} = 0$
(C) $div\ \vec{r} \neq 0$	(D) $curl\ \vec{r} \neq 0$

- (selected) A
- B
- C
- D

5 *

If $\vec{F}$ is irrotational, then $Curl\ \vec{F} =$

(A) 1	(B) 2
(C) 3	(D) $\vec{0}$

- A
- B
- C
- (selected) D

6 *

If $\vec{u}$ and $\vec{v}$ are irrotational, then $\vec{u} \times \vec{v}$ is

(A) irrotational (B) solenoidal

(C) zero vector (D) constant

- ○ A
- ◉ B
- ○ C
- ○ D

7 *

The condition for $\vec{F}$ to be conservative is

(A) $\nabla \bullet \vec{F} = 0$ (B) $\vec{F} = 0$

(C) $\nabla \times \vec{F} = \vec{0}$ (D) $\vec{F} = 1$

- ○ A
- ○ B
- ◉ C
- ○ D

8 *

By Green's theorem, the area bounded by a simple closed curve is

(A) $\int_C x\,dy - y\,dx$	(B) $\int_C x\,dy + y\,dx$
(C) $\int_C y\,dx - x\,dy$	(D) $\frac{1}{2}\left(\int_C x\,dy - y\,dx\right)$

- ○ A
- ○ B
- ○ C
- ◉ D

9 *

By Stoke's theorem, $\int_C \vec{F} \bullet d\vec{r} =$

(A) $\iint_S \nabla \times \vec{F}\, dS$	(B) $\iint_S \nabla \bullet \vec{F}\, dS$
(C) $\iint_S (\nabla \bullet \vec{F})\, \hat{n}\, dS$	(D) $\iint_S (\nabla \times \vec{F}) \bullet \hat{n}\, dS$

- ○ A
- ○ B
- ○ C
- ◉ D

10 *

The relation between the surface integral and the volume integral is given by

(A) Green's Theorem (B) Stoke's Theorem

(C) Gauss Divergence Theorem (D) Cauchy's Theorem

- ○ A
- ○ B
- ◉ C
- ○ D

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