## Level 1:

## Level 1: If $\vec{u}=\langle 2,-1,-2\rangle$, then what is the magnitude (or length) of $\vec{u}$ ?

## Level 1: If $\vec{u}=\langle 2,-1,-2\rangle$, then what is the magnitude

 (or length) of $\overrightarrow{\boldsymbol{u}}$ ?(a) 2
(b) 3
(c) 6
(d) 9

## Level 1: If $\vec{u}=\langle 2,-1,-2\rangle$, then what is the magnitude

 (or length) of $\vec{u}$ ?(a) 2
(b) 3
(c) 6
(d) 9

Is That Your Final Answer?

## Level 1: If $\vec{u}=\langle 2,-1,-2\rangle$, then what is the magnitude

 (or length) of $\overrightarrow{\boldsymbol{u}}$ ?(a) 2
(b) 3
(c) 6
(d) 9

## Level 2:

Level 2: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} d y d x$ ?

Level 2: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} d y d x$ ?
(a) $\pi^{2} / 2$
(b) $\pi^{2} / 3$
(c) 1
(d) 0

Level 2: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} d y d x$ ?
(a) $\pi^{2} / 2$
(b) $\pi^{2} / 3$
(c) 1
(d) 0

## Is That Your Final Answer?

Level 2: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} d y d x$ ?
(a) $\pi^{2} / 2$
(b) $\pi^{2} / 3$
(c) 1
(d) 0

## Level 3:

## Level 3: Let $\vec{u}=\langle 1,-2,2\rangle$ and $\vec{v}=\langle-1,0,-1\rangle$. What is the smallest angle $\theta$ between these two vectors?

## Level 3: Let $\vec{u}=\langle 1,-2,2\rangle$ and $\vec{v}=\langle-1,0,-1\rangle$. What is the smallest angle $\theta$ between these two vectors?

(a) $3 \pi / 4$
(b) $2 \pi / 3$
(c) $5 \pi / 3$
(d) $\pi / 2$

## Level 3: Let $\overrightarrow{\boldsymbol{u}}=\langle 1,-2,2\rangle$ and $\overrightarrow{\boldsymbol{v}}=\langle-1,0,-1\rangle$. What is the smallest angle $\boldsymbol{\theta}$ between these two vectors?

(a) $3 \pi / 4$
(b) $2 \pi / 3$
(c) $5 \pi / 3$
(d) $\pi / 2$

Is That Your Final Answer?

## Level 3: Let $\vec{u}=\langle 1,-2,2\rangle$ and $\vec{v}=\langle-1,0,-1\rangle$. What is the smallest angle $\theta$ between these two vectors?

(a) $3 \pi / 4$
(b) $2 \pi / 3$
(c) $5 \pi / 3$
(d) $\pi / 2$

## Level 4:

Level 4: Which of the following is an equation for the tangent plane to the surface $z=x^{2}-2 y^{2}$ at the point $(3,2,1)$ ?

Level 4: Which of the following is an equation for the tangent plane to the surface $z=x^{2}-2 y^{2}$ at the point $(3,2,1)$ ?
(a) $2 x-4 y=1$
(b) $2 x-4 y-z=-3$
(c) $6 x-8 y-z=3$
(d) $6 x-8 y-z=1$

Level 4: Which of the following is an equation for the tangent plane to the surface $z=x^{2}-2 y^{2}$ at the point $(3,2,1)$ ?
(a) $2 x-4 y=1$
(b) $2 x-4 y-z=-3$
(c) $6 x-8 y-z=3$
(d) $6 x-8 y-z=1$

Is That Your Final Answer?

Level 4: Which of the following is an equation for the tangent plane to the surface $z=x^{2}-2 y^{2}$ at the point $(3,2,1)$ ?
(a) $2 x-4 y=1$
(b) $2 x-4 y-z=-3$
(c) $6 x-8 y-z=3$
(d) $6 x-8 y-z=1$

## Level 5:

## Level 5: If the Cartesian coordinates (rectangular coordi-

 nates) of a point are $(0, \sqrt{3},-1)$, then what is the corresponding angle $\phi$ in spherical coordinates?
## Level 5: If the Cartesian coordinates (rectangular coordi-

 nates) of a point are $(0, \sqrt{3},-1)$, then what is the corresponding angle $\phi$ in spherical coordinates?(a) $\pi / 6$
(b) $\pi / 3$
(c) $2 \pi / 3$
(d) $5 \pi / 6$

## Level 5: If the Cartesian coordinates (rectangular coordi-

 nates) of a point are $(0, \sqrt{3},-1)$, then what is the corresponding angle $\phi$ in spherical coordinates?(a) $\pi / 6$
(b) $\pi / 3$
(c) $2 \pi / 3$
(d) $5 \pi / 6$

Is That Your Final Answer?

## Level 5: If the Cartesian coordinates (rectangular coordi-

 nates) of a point are $(0, \sqrt{3},-1)$, then what is the corresponding angle $\phi$ in spherical coordinates?(a) $\pi / 6$
(b) $\pi / 3$
(c) $2 \pi / 3$
(d) $5 \pi / 6$

Level 6: For the function $f(x, y)=3 x^{2} y+3 x^{2}-y^{3}$, the point $(1,-1)$ determines ...

Level 6: For the function $f(x, y)=3 x^{2} y+3 x^{2}-y^{3}$, the point $(1,-1)$ determines ...
(a) a local maximum
(c) a saddle point
(b) a local minimum
(d) not a critical point

Level 6: For the function $f(x, y)=3 x^{2} y+3 x^{2}-y^{3}$, the point $(1,-1)$ determines ...
(a) a local maximum
(c) a saddle point
(b) a local minimum
(d) not a critical point

Is That Your Final Answer?

Level 6: For the function $f(x, y)=3 x^{2} y+3 x^{2}-y^{3}$, the point $(1,-1)$ determines ...
(a) a local maximum
(c) a saddle point
(b) a local minimum
(d) not a critical point

## Level 7:

Level 7: Which of the following are parametric equations for the line passing through $(11,3,8)$ and $(2,9,6)$ ?

Level 7: Which of the following are parametric equations for the line passing through $(11,3,8)$ and $(2,9,6)$ ?
(a) $\begin{aligned} & x=2-9 t \\ & y=9+6 t \\ & z=8-2 t\end{aligned}$
(b) $\begin{aligned} & x=24+18 t \\ & y=12-12 t \\ & z=8+4 t\end{aligned}$
(c) $\begin{aligned} & x=20+18 t \\ & y=-3-12 t \\ & z=10+4 t\end{aligned}$
(d) $x=2+9 t$
$y=9-6 t$
$z=10+2 t$

Level 7: Which of the following are parametric equations for the line passing through $(11,3,8)$ and $(2,9,6)$ ?
(a) $\begin{aligned} & x=2-9 t \\ & y=9+6 t \\ & z=8-2 t\end{aligned}$
(b) $\begin{aligned} & x=24+18 t \\ & y=12-12 t \\ & z=8+4 t\end{aligned}$
(c) $\begin{aligned} & x=20+18 t \\ & y=-3-12 t \\ & z=10+4 t\end{aligned}$
(d) $x=2+9 t$
$y=9-6 t$
$z=10+2 t$

Is That Your Final Answer?

Level 7: Which of the following are parametric equations for the line passing through $(11,3,8)$ and $(2,9,6)$ ?
(a) $\begin{aligned} & x=2-9 t \\ & \\ & y=9+6 t \\ & z=8-2 t\end{aligned}$
(b) $\begin{aligned} x & =24 \pm 18 t \\ y & =12 \pm 12 t \\ z & =8+4 t\end{aligned}$
(c) $\begin{aligned} & x=20+18 t \\ & y=-3-12 t \\ & z=10+4 t\end{aligned}$
(d) $x=2+9 t$
$y=9-6 t$
$z=10+2 t$

## Level 8:

## Level 8: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} \frac{\sin y}{\pi-y} d y d x$ ?

Level 8: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} \frac{\sin y}{\pi-y} d y d x$ ?
(a) 3
(b) 2
(c) 1
(d) 0

Level 8: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} \frac{\sin y}{\pi-y} d y d x$ ?
(a) 3
(b) 2
(c) 1
(d) 0

Is That Your Final Answer?

Level 8: What is the value of $\int_{0}^{\pi} \int_{0}^{\pi-x} \frac{\sin y}{\pi-y} d y d x$ ?
(a) 3
(b) 2
(c) 1
(d) 0

## Level 9:

## Level 9: Which of the following is a point $\boldsymbol{P}$ on the graph

 of $x^{2}-y^{2}=z^{2}-1$ with the tangent plane at $P$ parallel to the $x z$-plane?Level 9: Which of the following is a point $\boldsymbol{P}$ on the graph of $x^{2}-y^{2}=z^{2}-1$ with the tangent plane at $P$ parallel to the $x z$-plane?
(a) $(0,-1,0)$
(b) $(2,1,2)$
(c) $(1,1,-1)$
(d) $(0,0,1)$

Level 9: Which of the following is a point $\boldsymbol{P}$ on the graph of $x^{2}-y^{2}=z^{2}-1$ with the tangent plane at $P$ parallel to the $\boldsymbol{x} \boldsymbol{z}$-plane?
(a) $(0,-1,0)$
(b) $(2,1,2)$
(c) $(1,1,-1)$
(d) $(0,0,1)$

Is That Your Final Answer?

Level 9: Which of the following is a point $\boldsymbol{P}$ on the graph of $x^{2}-y^{2}=z^{2}-1$ with the tangent plane at $P$ parallel to the $x z$-plane?
(a) $(0,-1,0)$
(b) $(2,1,2)$
(c) $(1,1,-1)$
(d) $(0,0,1)$

## Level 10:

# Level 10: Calculate $\iiint_{S}\left(x^{2}+y^{2}\right)^{1 / 2} d V$ where $S$ is 

the solid between the paraboloids $z=x^{2}+y^{2}-1$ and $z=-2 x^{2}-2 y^{2}+8$.

Level 10: Calculate $\iiint_{S}\left(x^{2}+y^{2}\right)^{1 / 2} d V$ where $S$ is the solid between the paraboloids $z=x^{2}+y^{2}-1$ and $z=-2 x^{2}-2 y^{2}+8$.
(a) $81 \pi / 2$
(b) $36 \pi \sqrt{3} / 5$
(c) $162 \pi / 5$
(d) $81 \pi / 5$

Level 10: Calculate $\iiint_{S}\left(x^{2}+y^{2}\right)^{1 / 2} d V$ where $S$ is the solid between the paraboloids $z=x^{2}+y^{2}-1$ and $z=-2 x^{2}-2 y^{2}+8$.
(a) $81 \pi / 2$
(b) $36 \pi \sqrt{3} / 5$
(c) $162 \pi / 5$
(d) $81 \pi / 5$

Is That Your Final Answer?

Level 10: Calculate $\iiint_{S}\left(x^{2}+y^{2}\right)^{1 / 2} d V$ where $S$ is the solid between the paraboloids $z=x^{2}+y^{2}-1$ and $z=-2 x^{2}-2 y^{2}+8$.
(a) $81 \pi / 2$
(b) $36 \pi \sqrt{3} / 5$
(c) $162 \pi / 5$
(d) $81 \pi / 5$

## Level 11:

Level 11: A drop of water is placed gently onto the surface of $z=3 y^{2}-4 x^{2}$ at the point $(1,1,-1)$. In what direction does the drop begin to move? Express your answer as a unit vector $\langle\boldsymbol{a}, \boldsymbol{b}\rangle$ (so the raindrop will go in this direction along the surface).

Level 11: A drop of water is placed gently onto the surface of $z=3 y^{2}-4 x^{2}$ at the point $(1,1,-1)$. In what direction does the drop begin to move? Express your answer as a unit vector $\langle\boldsymbol{a}, \boldsymbol{b}\rangle$ (so the raindrop will go in this direction along the surface).
(a) $\langle 4 / 5,-3 / 5\rangle$
(b) $\langle-4 / 5,-3 / 5\rangle$
(c) $\langle-4 / 5,3 / 5\rangle$
(d) $\langle 4 / 5,3 / 5\rangle$

Level 11: A drop of water is placed gently onto the surface of $z=3 y^{2}-4 x^{2}$ at the point $(1,1,-1)$. In what direction does the drop begin to move? Express your answer as a unit vector $\langle\boldsymbol{a}, \boldsymbol{b}\rangle$ (so the raindrop will go in this direction along the surface).
(a) $\langle 4 / 5,-3 / 5\rangle$
(b) $\langle-4 / 5,-3 / 5\rangle$
(c) $\langle-4 / 5,3 / 5\rangle$
(d) $\langle 4 / 5,3 / 5\rangle$

Is That Your Final Answer?

Level 11: A drop of water is placed gently onto the surface of $z=3 y^{2}-4 x^{2}$ at the point $(1,1,-1)$. In what direction does the drop begin to move? Express your answer as a unit vector $\langle\boldsymbol{a}, \boldsymbol{b}\rangle$ (so the raindrop will go in this direction along the surface).
(a) $\langle 4 / 5,-3 / 5\rangle$
(b) $\langle-4 / 5,-3 / 5\rangle$
(c) $\langle-4 / 5,3 / 5\rangle$
(d) $\langle 4 / 5,3 / 5\rangle$

## Level 12:

## Level 12: What is the value of

$$
\lim _{h \rightarrow 0} \frac{e^{x(y+h)}-e^{x y}}{h}
$$

## Level 12: What is the value of

$$
\lim _{h \rightarrow 0} \frac{e^{x(y+h)}-e^{x y}}{h} ?
$$

(a) $e^{x y} \quad$ (b) $x e^{x y} \quad$ (c) $y e^{x y}$
(d) does not exist

## Level 12: What is the value of

$$
\lim _{h \rightarrow 0} \frac{e^{x(y+h)}-e^{x y}}{h} ?
$$

(a) $e^{x y} \quad$ (b) $x e^{x y} \quad$ (c) $y e^{x y} \quad$ (d) does not exist

## Is That Your Final Answer?

## Level 12: What is the value of

$$
\lim _{h \rightarrow 0} \frac{e^{x(y+h)}-e^{x y}}{h} ?
$$

(a) $e^{x y} \quad$ (b) $x e^{x y} \quad$ (c) $y e^{x y} \quad$ (d) does not exist

## Level 13:

Level 13: What is the value of $\iiint_{S}\left(x^{2}+y^{2}\right)^{3 / 2} d V$
where $S$ is the solid inside the cylinder $x^{2}+y^{2}=1$, below the cone $z=4-\sqrt{x^{2}+y^{2}}$ and above the plane $z=0$ ?

Level 13: What is the value of $\iiint_{S}\left(x^{2}+y^{2}\right)^{3 / 2} d V$
where $S$ is the solid inside the cylinder $x^{2}+y^{2}=1$, below the cone $z=4-\sqrt{x^{2}+y^{2}}$ and above the plane $z=0$ ?
(a) $8 \pi / 5$
(b) $9 \pi / 10$
(c) $10 \pi / 3$
(d) $19 \pi / 15$

# Level 13: What is the value of $\iiint_{S}\left(x^{2}+y^{2}\right)^{3 / 2} d V$ 

where $S$ is the solid inside the cylinder $x^{2}+y^{2}=1$, below the cone $z=4-\sqrt{x^{2}+y^{2}}$ and above the plane $z=0$ ?
(a) $8 \pi / 5$
(b) $9 \pi / 10$
(c) $10 \pi / 3$
(d) $19 \pi / 15$

Is That Your Final Answer?

Level 13: What is the value of $\iiint_{S}\left(x^{2}+y^{2}\right)^{3 / 2} d V$
where $S$ is the solid inside the cylinder $x^{2}+y^{2}=1$, below the cone $z=4-\sqrt{x^{2}+y^{2}}$ and above the plane $z=0$ ?
(a) $8 \pi / 5$
(b) $9 \pi / 10$
(c) $10 \pi / 3$
(d) $19 \pi / 15$

## Level 14:

Level 14: What is the shortest distance from a point on the graph of $z=x^{2}-3 y^{2}-1$ to the origin $(0,0,0)$ ?

Level 14: What is the shortest distance from a point on the graph of $z=x^{2}-3 y^{2}-1$ to the origin $(0,0,0)$ ?
(a) $1 / 2$
(b) $\sqrt{2} / 2$
(c) $\sqrt{3} / 2$
(d) 1

Level 14: What is the shortest distance from a point on the graph of $z=x^{2}-3 y^{2}-1$ to the origin $(0,0,0)$ ?
(a) $1 / 2$
(b) $\sqrt{2} / 2$
(c) $\sqrt{3} / 2$
(d) 1

Is That Your Final Answer?

Level 14: What is the shortest distance from a point on the graph of $z=x^{2}-3 y^{2}-1$ to the origin $(0,0,0)$ ?
(a) $1 / 2$
(b) $\sqrt{2} / 2$
(c) $\sqrt{3} / 2$
(d) 1

## Level 15:

## Level 15: What is the value of

$$
\int_{0}^{\pi} \int_{0}^{2} \int_{0}^{1} z x^{2} \sin (x y z) d x d y d z ?
$$

## Level 15: What is the value of

$$
\int_{0}^{\pi} \int_{0}^{2} \int_{0}^{1} z x^{2} \sin (x y z) d x d y d z ?
$$

(a) $\pi / 4$
(b) $\pi / 3$
(c) $\pi / 2$
(d) none of the above

## Level 15: What is the value of

$$
\int_{0}^{\pi} \int_{0}^{2} \int_{0}^{1} z x^{2} \sin (x y z) d x d y d z ?
$$

(a) $\pi / 4$
(b) $\pi / 3$
(c) $\pi / 2$
(d) none of the above

Is That Your Final Answer?

## Level 15: What is the value of

$$
\int_{0}^{\pi} \int_{0}^{2} \int_{0}^{1} z x^{2} \sin (x y z) d x d y d z ?
$$

(a) $\pi / 4$
(b) $\pi / 3$
(c) $\pi / 2$
(d) none of the above

