If the line $x = 2 + 3t,\ \ y = -4t,\ \ z = 5 + t$ intersects the plane $2x - y + z = -2$ at (a, b, c) then $a + b + c =$

Select one:

- -2
- 4
- 8
- 7 ✔
- 5

The correct answer is: 7

Let $\mathrm{r}(t) = e^t\mathrm{i} + (e^t \sin t)\mathrm{j} + (e^t \cos t)\mathrm{k}$, $0 \leq t \leq \pi$. Then the normal component of acceleration $\mathrm{a}_N =$

Select one:

- $\sqrt{2}e^t$ ✔
- $\sqrt{2}e^{-t}$
- $\frac{2}{\sqrt{3}}e^{3t}$
- $2e^t$

The correct answer is: $\sqrt{2}e^t$

A vector in two dimensional space $\overrightarrow{v}$ that makes an angle $\frac{\pi}{4}$ with the positive $x-$axis and with $|\overrightarrow{v}| = 6$ is given by:

Select one:

- ○ $\overrightarrow{v} = -3\sqrt{2}\ i + 3\sqrt{2}\ j$
- ○ $\overrightarrow{v} = 6\ i$
- ◉ $\overrightarrow{v} = 3\sqrt{2}\ i + 3\sqrt{2}\ j$ ✔
- ○ $\overrightarrow{v} = 3\sqrt{3}\ i - 3\ j$
- ○ $\overrightarrow{v} = -3\sqrt{2}\ i - 3\sqrt{2}\ j$

The correct answer is: $\overrightarrow{v} = 3\sqrt{2}\ i + 3\sqrt{2}\ j$

If $\overrightarrow{v}$ is the vector projection of $\overrightarrow{a} = -i + j + k$ onto $\overrightarrow{b} = 2i - 3k$, then $\overrightarrow{a} - 13\overrightarrow{v} =$

Select one:

- $10i - 15k$
- $-3i + j + 4k$ ✖
- $2i - 3k$
- $-11i + j + 16k$
- $9i + j - 14k$

The correct answer is: $9i + j - 14k$

The set of points in $\mathbb{R}^3$ described by
$x^2 + y^2 + z^2 - 4y = 0,$
$x^2 + (y-2)^2 = 1,\ z > 0$ is

Select one:

- line segment from $(0, 2, 2)$ to $(0, 2, \sqrt{3})$
- a circle with radius 3
- a parabola with vertex $(0, 2, \sqrt{3})$
- a circle with center $(0, 2, \sqrt{3})$
- empty set ✖

The correct answer is: a circle with center $(0, 2, \sqrt{3})$

Let $\mathrm{r}(t) = e^t\mathrm{i} + (e^t \sin t)\mathrm{j} + (e^t \cos t)\mathrm{k}$, $0 \leq t \leq \pi$. Then the curvature κ is

Select one:

- $\sqrt{\frac{2}{3}}e^{-t}$
- $\frac{\sqrt{2}}{3}e^{-t}$
- $\frac{2}{\sqrt{3}}e^{-t}$ ✖
- $\frac{2}{\sqrt{3}}e^{t}$

The correct answer is: $\frac{\sqrt{2}}{3}e^{-t}$

If θ is the angle between the nonzero vectors $\vec{a}$ and $\vec{b}$, then $\cot\theta =$

Select one:

- $\dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|}$
- $\dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}\times\vec{b}|}$ ✔
- $(\vec{a}\cdot\vec{b})|\vec{a}\times\vec{b}|$
- $\dfrac{|\vec{a}\times\vec{b}|}{\vec{a}\cdot\vec{b}}$
- $\dfrac{|\vec{a}\times\vec{b}|}{|\vec{a}||\vec{b}|}$

The correct answer is: $\dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}\times\vec{b}|}$

The graph of the equation
$x^2 - y^2 + z^2 - 4x + 2y - 6z = k$ is a cone if

Select one:

- $k = 0$
- $k = -12$ ✔
- $k = 12$
- $k > 12$

The correct answer is: $k = -12$

If the area of the triangle with vertices $P(1,0,0)$, $Q(2,1,x)$ and $R(-1,1,-1)$ is equal to $\frac{5\sqrt{2}}{2}$, $x > 0$, then $x =$

Select one:

- 3 ✔
- $\frac{13}{5}$
- $\sqrt{2}$
- $\frac{1}{\sqrt{2}}$
- 6

The correct answer is: 3

If the area of the triangle with vertices $P(1,0,0)$, $Q(2,1,x)$ and $R(-1,1,-1)$ is equal to $\frac{5\sqrt{2}}{2}$, $x > 0$, then $x =$

Select one:

- (selected) 3 ✓
- $\frac{13}{5}$
- $\sqrt{2}$
- $\frac{1}{\sqrt{2}}$
- 6

The correct answer is: 3

The graph of the equation $x^2 - y^2 + z^2 - 4x + 2y - 6z = k$ is a cone if

Select one:

- $k = 0$
- $k = -12$ ✔
- $k = 12$
- $k > 12$

The correct answer is: $k = -12$

The equation $x^2 + y^2 + z^2 - 2x - 4y + 8z = 15$ represents

Select one:

- a point
- no graph in $\mathbb{R}^3$
- a sphere with center $(0, 0, 0)$ and radius $\frac{1}{5}$
- a sphere with center $(0, -2, \frac{1}{2})$ and radius 7
- a sphere with center $(1, 2, -4)$ and radius 6 ✔

The correct answer is: a sphere with center $(1, 2, -4)$ and radius 6

Let $\mathrm{r}(t) = e^t\mathrm{i} + (e^t \sin t)\mathrm{j} + (e^t \cos t)\mathrm{k}$, $0 \leq t \leq \pi$. Then the speed $|v(t)| =$

Select one:

- $\sqrt{3}e^t$
- $3e^{2t}$ ✖
- $3e^t$
- $\sqrt{3}e^{2t}$

The correct answer is: $\sqrt{3}e^t$

Let $\mathrm{r}(t) = \cos^3 t\mathrm{i} + \sin^3 t\mathrm{j},\ 0 \leq t \leq \frac{\pi}{2}$. Then the unit tangent vector $\mathrm{T}(t)$ is

Select one:

- $T(t) = \sin t\ \mathrm{i} + \cos t\ \mathrm{j}$
- $T(t) = -\sin t\ \mathrm{i} + \cos t\ \mathrm{j}$
- $T(t) = -\cos t\ \mathrm{i} + \sin t\ \mathrm{j}$ ✔
- $T(t) = -\cos t\ \mathrm{i} - \sin t\ \mathrm{j}$

The correct answer is: $T(t) = -\cos t\ \mathrm{i} + \sin t\ \mathrm{j}$

Let $A(1,0,-4)$, $B(4,4,8)$, and $C(a,b,c)$ be points in three dimensional space. If $\overrightarrow{AC}$ is the unit vector in the same direction as $\overrightarrow{AB}$, then $26(a+b+c) =$

Select one:

- 10
- -40 ✔
- 20
- 50
- -4

The correct answer is: -40

Symmetric equations for the line through the point $(1, -2, -4)$ that is orthogonal to the plane $2x - y + 3z = 5$ are given by

Select one:

- $\frac{x-1}{2} = y + 2 = \frac{z+4}{3}$
- $\frac{x+1}{\sqrt{14}} = \frac{y-2}{\sqrt{14}} = \frac{z-4}{\sqrt{14}}$
- $\frac{x+1}{2} = \frac{y-2}{-1} = \frac{z-4}{3}$
- $\frac{x-1}{\sqrt{14}} = \frac{y+2}{\sqrt{14}} = \frac{z+4}{\sqrt{14}}$
- $\frac{x-1}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$ ✔

The correct answer is: $\frac{x-1}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$

Let $\mathrm{r}(t) = \cos^3 t\mathrm{i} + \sin^3 t\mathrm{j}$, $0 \leq t \leq \frac{\pi}{2}$. Then the arc length parameter for $\mathrm{r}(t)$ is (take $t_0 = 0$)

Select one:

- (selected) $\frac{3}{2}\sin^2 t$ ✓
- $\sin^2 t$
- $\frac{1}{2}\cos^2 t$
- $-\frac{3}{2}\sin^2 t$

The correct answer is: $\frac{3}{2}\sin^2 t$