The arc length function $s(t)$, for the curve $\vec{r}(t) = < \cos e^t , \sin e^t, \sqrt{8}\, e^t >$, measured from the point Q where $t = 0$, in the direction of increasing t is:

(A) $3e^{2t} - 3$

(B) $3e^t - 3$

(C) $\sqrt{8}\, e^t - 1$

(D) $3e^t - 1$

(E) $e^t - 1$

$$s(t) = \int_a^t \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2} \cdot dt$$

$$dx = -e^t \cdot \sin(e^t)$$

$$dy = e^t \cdot \cos(e^t)$$

$$dz = \sqrt{8} \cdot e^t$$

$$= \int_0^t \sqrt{e^{2t}(\sin^2(e^t) + \cos^2(e^t) + 8)} \cdot dt$$

$$= \int_0^t 3e^t \cdot dt$$

$$= 3e^t - 3$$

B

2

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The domain of the function $f(x,y) = \sqrt{x-4} + \frac{1}{\sqrt{y-2}}$, is

A) All the points in the xy-plane that lie to the right of (or on) the line $x = 4$ and below the line $y = 2$.

B) All the points in the xy-plane that lie to the left of (or on) the line $x = 4$ and below the line $y = 2$.

C) All the points in the xy-plane except the point (4,2).

D) All the points in the xy-plane that lie to the right of (or on) the line $x = 4$ and above the line $y = 2$.

E) All the points in the xy-plane that lie to the right of (or on) the line $x = 4$ and above (or on) the line $y = 2$.

$x - 4 \geq 0$

$\underline{x \geq 4}$

$y - 2 \geq 0$

$y \geq 2$, But the root is in the denominator

So it'll be $\underline{y > 2}$

D

A vector function that represents the curve of intersection of the cylinder $y^2 + z^2 = 16$ and the surface $x = yz$ is

(A) $\vec{r}(t) = < 4\cos t\,,\ 4\sin t\,,\ 8\sin 2t >$

(B) $\vec{r}(t) = < 4\cos t\,,\ \sin t\,,\ 8\sin 2t >$

(C) $\vec{r}(t) = < 8\sin 2t\,,\ 4\cos 2t\,,\ 4\sin 2t >$

(D) $\vec{r}(t) = < 8\sin 2t\,,\ 4\cos t\,,\ 4\sin t >$

(E) $\vec{r}(t) = < 8\cos 2t\,,\ 4\cos 2t\,,\ 4\sin t >$

ε

$x = yz$

$y^2 + z^2 = 16$

$y = \sqrt{16 - z^2}$

$x = z\sqrt{16 - z^2}$

By trial & error

when $z = 4\sin(t)$

$y = \sqrt{16 - 16\sin^2 t}$

$y = 4\cos(t)$

$x = 4\cos(t) \cdot 4\sin(t)$

$\cancel{x = 18\sin(2t)}$

$x = 8\sin(2t)$

D

Suppose f is a differentiable function of x and y, and $g(t,s) = f(x,y)$ where $x = 4t - s^2$ and $y = \frac{1}{2}se^{t-1}$. Use the table of values to calculate $g_s(1,2)$.

	f	g	f_x	f_y
(0,1)	3	10	5	4
(1,2)	10	2	1	3

A) 4

B) 8

C) 14

D) 24

E) −18

from the table

$$\frac{\partial g}{\partial s} = \frac{\partial g}{\partial x} \cdot \frac{\partial x}{\partial s} + \frac{\partial g}{\partial y} \cdot \frac{\partial y}{\partial s}$$

$$= 5 \cdot (-4) + 4 \cdot \left(\frac{1}{2}\right)$$

$$= \underline{-18}$$

E

$g = f$

$t = 1$

$s = 2$

$x = 0$

$y = 1$

$$\frac{\partial x}{\partial s} = -2s$$

$$\left.\frac{\partial x}{\partial s}\right|_{s=2} = -4$$

$$\frac{\partial y}{\partial s} = \frac{1}{2} e^{t-1}$$

$$\left.\frac{\partial y}{\partial s}\right|_{t=1} = \frac{1}{2}$$

Parametric equations for the tangent line to the curve of the vector function:

$\vec{r}(t) = < 2\sqrt{t}, t^2, -3t >$ at the point $(2, 1, -3)$ is:

(A) $x = 2 + 2t$, $y = 1 + 2t$, $z = -3 - 3t$

(B) $x = 2 + t$, $y = 1 - 2t$, $z = -3 - 3t$

(C) $x = 2 + t$, $y = 1 + 2t$, $z = -3 - 3t$

(D) $x = 2 + t$, $y = 1 + 2t$, $z = -3 + 3t$

(E) $x = -2 - t$, $y = -1 - 2t$, $z = 3 + 3t$

$-3t = -3$

$t = 1$

$r'(t) = \langle \frac{1}{\sqrt{t}}, 2t, -3 \rangle$

sub $t=1 \rightarrow r'(t) = \langle 1, 2, -3 \rangle$ @ $(2, 1, -3)$

$x = 2 + t$

$y = 1 + 2t$

$z = -3 - 3t$ (c)

$$\lim_{(x,y)\to(0,0)} \frac{xy^3}{x^2+y^6}$$

(A) does not exist, since along the x-axis the limit is 0, and along $x = y^3$ the limit is $\frac{1}{2}$

(B) does not exist, since along the y-axis the limit is 1, and along $x = y^3$ the limit is $\frac{1}{2}$

(C) does not exist, since along the x-axis the limit is 0, and along $y = x^3$ the limit is $\frac{1}{2}$

(D) does not exist, since along the $x = my^3$, the limit is $\frac{m}{m+1}$

(E) The limit exists and equals to $\frac{1}{2}$, since along $x = y^3$ the limit is $\frac{1}{2}$

$$\lim_{x,y \to 0,0} \frac{xy^3}{x^2 + y^6} = \frac{0}{0}$$

along $x = 0 \to \lim \frac{0}{y^6} = 0$

along $y = 0 \to \lim \frac{0}{x^2} = 0$

along $x = y^3 \to \lim \frac{\cancel{y^6}}{2\cancel{y^6}} = \boxed{\frac{1}{2}}$

D.N.E A

At the point (0,0), the linearization of the function $f(x, y) = \frac{2x+3}{1-4y}$ is

(A) $L(x,y) = -3 + 2x - 12y$

(B) $L(x,y) = -3 - 2x - 12y$

(C) $L(x,y) = -3 + 2x + 12y$

(D) $L(x,y) = 3 - 2x + 12y$

(E) $L(x,y) = 3 + 2x + 12y$

$$f(x,y) = \frac{2x+3}{1-4y} \qquad (a,b) = (0,0)$$

$$L(x,y) = f(a,b) + f_x(a,b)(x-a) + f_y(a,b)(y-b)$$

$$= 3 + 2x + 12y$$

$$f(a,b) = 3$$

$$f_x(a,b) = 2$$

$$f_y(a,b) = 12$$

The arc length of the curve $\vec{r}(t) =< 5\ sint, 5\cos t, 2 >$ from $t = -3$ to $t = 3$ is

(A) 15

(B) 20

(C) 30

(D) 9

(E) 5

Select one:

- A
- B
- C

$$s(t) = \int_a^t \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2} \cdot dt$$

$dx = 5 \cos t$

$dy = -5 \sin t$

$dz = 0$

$$= \int_{-3}^{3} \sqrt{25(\sin^2 t + \cos^2 t)} \cdot dt$$

$$= 5(3 - -3)$$

$$= 30 \quad \text{c}$$

The curvature of the curve of the function $f(x) = 3\ln x$, is

(A) $\frac{3}{x^2(1+\frac{9}{x^2})^{3/2}}$

(B) $\frac{3}{x^2(1-\frac{9}{x^2})^{3/2}}$

(C) $\frac{9}{x^2(1+\frac{3}{x^2})^{3/2}}$

(D) $\frac{-3}{x^2(1-\frac{9}{x^2})^{3/2}}$

(E) $\frac{-3}{x^2(1+\frac{9}{x^2})^{3/2}}$

(A) ○

(B) ○

(C) ○

(D) ○

$$K(x) = \frac{|f''(x)|}{\left(1 + (f'(x))^2\right)^{3/2}}$$

$$f(x) = 3\ln(x)$$

$$f'(x) = \frac{3}{x}$$

$$f''(x) = \frac{-3}{x^2}$$

$$K(x) = \frac{+3}{x^2\left(1 + \frac{9}{x^2}\right)^{3/2}}$$

A

The curvature of the curve $\vec{r}(t) = \langle -t, t^2, t^3 \rangle$, is

(A) $\dfrac{\sqrt{36t^4+36t^2+4}}{(1+4t^2+9t^4)^3}$

(B) $\dfrac{\sqrt{6t^2-6t+2}}{(1+4t^2+9t^4)^{3/2}}$

(C) $\dfrac{\sqrt{36t^4+36t^2+4}}{(1+4t^2+9t^4)^{3/2}}$

(D) $\dfrac{\sqrt{36t^4-36t^2+4}}{(1+4t^2+9t^4)^{3/2}}$

(E) $\dfrac{\sqrt{36t^4+36t^2+4}}{(1+4t^2+9t^4)^{1/2}}$

$$K = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3}$$

$r'(t) = \langle -1, 2t, 3t^2 \rangle$

$r''(t) = \langle 0, 2, 6t \rangle$

$$K = \frac{\sqrt{36t^4 + 36t^2 + 4}}{(1 + 4t^2 + 9t^4)^{3/2}}$$

$$r'(t) \times r''(t) = \begin{vmatrix} i & j & k \\ -1 & 2t & 3t^2 \\ 0 & 2 & 6t \end{vmatrix} = \langle 6t^2, 6t, -2 \rangle$$

c

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Find the curvature of the curve

C: $\bar{r}(t) =< t^2, 2t, e^t >$: when $t = 0$

(A) 0

(B) $\frac{\sqrt{8}}{(\sqrt{5})^3}$

(C) $\frac{\sqrt{24}}{5\sqrt{5}}$

(D) $\frac{\sqrt{5}}{(\sqrt{24})^3}$

(E) $\frac{\sqrt{24}}{125}$

Select one:

- A
- B
- C
- D
- E

$$K = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3}$$

$$r(t) = \langle t^2, 2t, e^t \rangle$$

$$r'(t) = \langle 2t, 2, e^t \rangle$$

$$r''(t) = \langle 2, 0, e^t \rangle$$

$$|r'(t)| = \sqrt{4t^2 + 4 + e^{2t}}$$

$$|r'(0)| = \sqrt{5}$$

$$\cancel{|r''(t)| = \sqrt{4 +}}$$

$$r'(t) \times r''(t) = \begin{vmatrix} i & j & k \\ 2t & 2 & e^t \\ 2 & 0 & e^t \end{vmatrix} = \langle 2e^t, \;, -4 \rangle$$

$$2e^t(t-1)$$

$$|r'(t) \times r''(t)| = \sqrt{4e^{2t} + 4e^{2t}(t-1)^2 + 16}$$

$$@\, t = 0 \rightarrow \sqrt{24}$$

$$K = \frac{\sqrt{24}}{5\sqrt{5}} \quad c$$

The length of the curve

$$\vec{r}(t) = \langle t, 2\cos t, 2\sin t \rangle, \ -2 \le t \le 2, \text{ is}$$

(A) $6\sqrt{5}$

(B) $4\sqrt{5}$

(C) $2\sqrt{5}$

(D) $2\sqrt{3}$

(E) 4

(A)

(B)

(C)

(D)

(E)

$$L(t) = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2} \, .dt$$

$$\frac{dx}{dt} = 1$$

$$\frac{dy}{dt} = -2\sin t$$

$$\frac{dz}{dt} = 2\cos t$$

$$= \int_{-2}^{2} \sqrt{1 + 4(\sin^2 t + \cos^2 t)} \, .dt$$

$$= 4\sqrt{5}$$

B

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The domain of the function $f(x,y) = \frac{\sqrt{y-x^2}}{\sqrt{x^2-4}}$ is

A) $\{(x,y)|x \geq y^2, y \neq \mp 2\}$

B) $\{(x,y)|y \geq x^2, x \neq \mp 2\}$

C) $\{(x,y)|x > 2 \; or \; x < -2\}$

D) $\{(x,y)|-2 < x < 2\}$

E) $\{(x,y)|y \geq x^2, |x| > 2\}$

Select one:

- ○ A
- ○ B
- ○ C
- ○ D
- ◉ E

$y - x^2 \geqslant 0$

$y \geqslant x^2$

$x^2 - 4 > 0$

$-2 > x > 2$

E

Scanned with CamScanner

The domain of the function $f(x,y)=\frac{\sqrt{25-x^2-y^2}}{9-x^2}$ is:

(A) The set of points in $\mathbb{R}^2$ **but not on** the lines $x=3$, $x=-3$

(B) The set of points (x,y) **on** the circle centered at $(0,0)$, with radius 5, and **not on the lines** $x=3$, $x=-3$

(C) The set of points (x,y) **inside** the circle centered at $(0,0)$, with radius 5, **but not on** the lines $x=3$, $x=-3$

(D) The set of points (x,y) **on** or **inside** the circle centered at $(0,0)$, with radius 5

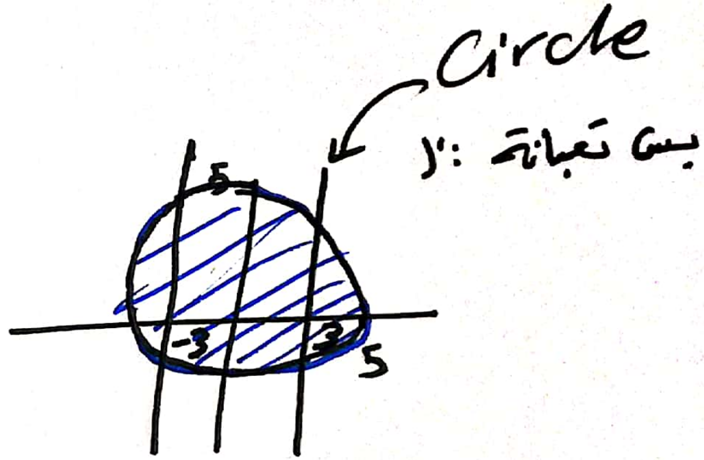
(E) The set of points (x,y) **on** or **inside** the circle centered at $(0,0)$ **but not on** lines $x=3$, $x=-3$

$9 - x^2 = 0$

$x = 3 \quad , \quad x = -3$

$25 - x^2 - y^2 \geq 0$

$x^2 + y^2 \leq 0$



on or inside the circle

but not on $x = 3 \;,\; x = -3$

E

The function $f(x, y, z) = 2sin\sqrt{3x^2 + 5y^2 + z^2}$ is continuous on

A) $\mathbb{R}$

B) $x \geq 0,\ y \geq 0,\ z \geq 0$

C) $\mathbb{R}^3$ (3-space)

D) $3x^2 + 5y^2 + z^2 > 0$

E) $\sqrt{3}x + \sqrt{5}y + z \geq 0$

Select one:

- A
- B
- C
- D
- E

R^3 (3-space) ©

what ever the inputs are the root will be cont.

If $\mathbf{r}'(\mathbf{t}) = < 2\sin 2t\,, 3\cos 3t, \cos t >$ and $\mathbf{r}\left(\frac{\pi}{6}\right) = \langle 1,1,3 \rangle$ then $\boldsymbol{r}(\boldsymbol{t}) =$

A) $< -\cos 2t + \frac{3}{2}\ , \sin 3t\,, \sin t + \frac{5}{2} >$

B) $< \sin t + \frac{1}{2}\,, -\cos 2t + \frac{3}{2}\,, \sin 3t + 2 >$

C) $< \sin t + \frac{1}{2}\,, \sin 3t\,, -\cos 2t + \frac{7}{2} >$

D) $< \sin 3t\,, \sin t + \frac{1}{2}\,, -\cos 2t + \frac{7}{2} >$

E) $< -\cos 2t + \frac{3}{2}\ , \sin 3t\,, -\sin t + \frac{7}{2} >$

$$r'(t) = \langle 2\sin 2t, \quad 3\cos 3t, \quad \cos t \rangle$$

$$r(t) = \langle -\cos(2t) + C_1, \quad \sin(3t) + C_2, \quad \sin(t) + C_3 \rangle$$

$$r\left(\frac{\pi}{6}\right) = \langle 1, \quad 1, \quad 3 \rangle$$

$-\frac{1}{2} + C_1 = 1$ $\qquad$ $1 + C_2 = 1$ $\qquad$ $\frac{1}{2} + C_3 = 3$

$C_1 = \frac{3}{2}$ $\qquad$ $C_2 = 0$ $\qquad$ $C_3 = \frac{5}{2}$

$$r(t) = \langle -\cos(2t) + \frac{3}{2}, \quad \sin(3t), \quad \sin(t) + \frac{5}{2} \rangle$$

A

The helix $\vec{r}(t) = \langle t, cost, sint \rangle$ intersects the sphere

$$x^2 + y^2 + z^2 = 17 \quad \text{at} \quad t =$$

(A) 0, 4

(B) $0, -4$

(C) ∓ 4

(D) never intersect it

(E) ∓ 17

(A)

(B)

(C)

(D)

(E)

$x = t$, $y = \cos t$, $z = \sin t$ $\rightarrow$ sub in $x^2 + y^2 + z^2 = 17$

$$t^2 + \underbrace{\cos^2 t + \sin^2 t}_{1} = 17$$

$$t^2 = 16$$

$$t = 4, -4$$ C

One of the following is a vector function that represents the curve of intersection of the cylinder $x^2 + y^2 = a$, $a > 0$ and the surface $z = 6xy$:-

A) $\langle acost, asint, 6acost\ sint \rangle$, $\quad 0 \leq t \leq 2\pi$

B) $\langle acost, asint, 6a^2cost\ sint \rangle$, $\quad 0 \leq t \leq 2\pi$

C) $\langle \sqrt{a}cost, \sqrt{a}\ sint,\ \ 3asin(2t) \rangle$, $\quad 0 \leq t \leq 2\pi$

D) $\langle\ cost, sint, 6cost\ sint \rangle$, $\quad 0 \leq t \leq 2\pi$

E) $\langle \sqrt{a}\ cost, \sqrt{a}\ sint, acost\ sint \rangle$, $\quad 0 \leq t \leq 2\pi$

$x = \sqrt{a - y^2}$

$z = 6y\sqrt{a - y^2}$

Trial & error

$\langle \sqrt{a} \cos t, \sqrt{a} \sin t, 3a \sin(2t) \rangle$ C stion 11

yet
wered

ked out of

log
stion

$$Lim_{(x,y)\to(0,0)} \frac{e^{(x^2+y^2)}-1}{x^2+y^2} =$$

- A. 1
- B. 4
- C. Does not exists
- D. 0
- E. -1

$$\lim_{x,y\to 0,0} \frac{e^{(x^2+y^2)}-1}{x^2+y^2} \to \lim_{r\to 0} \frac{e^{r^2}-1}{r^2} = \frac{0}{0}$$ l'hopital

$$\lim_{r\to 0} \frac{\cancel{2r}\, e^{r^2}}{\cancel{2r}} = \boxed{1}$$ A

The value of $\lim_{(x,y)\to(0,0)} \frac{2y^2 \sin^2 x}{x^4+y^4}$ along $y = x$ is

A) 1

B) 2

C) does not exist

D) 0

E) $\frac{1}{2}$

Select one:

- A
- B
- C
- D
- E

Clear my choice

$$\lim_{x,y \to 0,0} \frac{2y^2 \sin^2 x}{x^4 + y^4}$$ along $y = x$

$$\lim_{x \to 0} \frac{2x^2 \sin^2 x}{2x^4} = \lim \left(\frac{\sin x}{x}\right)^2 = 1^2 = \boxed{1}$$

A

Question 7

Not yet answered

Marked out of 3.00

Flag question

$$\lim_{(x,y)\to(0,0)} \frac{5\,y}{\sqrt{x^2+y^2}}$$

(A) 0

(B) 5

(C) $\frac{5}{\sqrt{2}}$

(D) -5

(E) Doesn't exist

$$\lim_{x,y \to 0,0} \frac{5y}{\sqrt{x^2+y^2}} = \frac{0}{0}$$

along $x = 0 \to \lim \frac{5\cancel{y}}{\cancel{y}} = 5$

along $y = 0 \to \lim \frac{0}{x} = 0$

D.N.E E

The linear approximation at $(0, 0)$ for the function $f(x, y) = e^x \, cos(xy)$

A. $1 + 3x$

B. $1 + 2x$

C. $1 - 2x$

D. $1 + x$

E. $1 - x$

The correct answer is:

$1 + x$

$f(x,y) = e^x \cos(xy)$

$L(x,y) = f(a,b) + f_x(a,b)(x-a) + f_y(a,b)(y-b)$

$= 1 + x$ D

$f(0,0) = 1$

$f_x = e^x \cos(xy) - y e^x \sin(xy)$

$f_y = -x e^x \sin(xy)$

$f_x(0,0) = 1$

$f_y(0,0) = 0$

The linear approximation of e^{xyz} at $(2,1,0)$ is:

A) $e^{xyz} \approx 1+2x$
B) $e^{xyz} \approx 1+2z$
C) $e^{xyz} \approx 1+2y$
D) $e^{xyz} \approx 1+2x+2y$
E) $e^{xyz} \approx 1+2x+2z$

Select one:

- A
- B
- C
- D
- E

$$f(x,y,z) = e^{xyz} \ @ \ (2,1,0)$$

$$L(x,y,z) = 1 + 2(z-0)$$

$$= 1 + 2z \qquad B$$

$$f(2,1,0) = 1$$

$$f_x = yz\,e^{xyz} \ @\!\to \ 0$$

$$f_y = xz\,e^{xyz} \ @\!\to \ 0$$

$$f_z = xy\,e^{xyz} \ @\!\to \ 2$$

The equation of the normal line to the surface $x^2 + 2y^2 - 3z^2 = 3$ at the point $(-2, -1, 1)$ is

(A) $\frac{x+2}{-4} = \frac{y+1}{4} = \frac{z-1}{-3}$

(B) $\frac{x-2}{-4} = \frac{y+1}{-4} = \frac{z-1}{-3}$

(C) $\frac{x+2}{4} = \frac{y+1}{-4} = \frac{z-1}{-6}$

(D) $\frac{x+2}{-4} = \frac{y+1}{-4} = \frac{z-1}{-6}$

(E) $\frac{x-1}{2} = \frac{y-2}{-1} = \frac{z+3}{-3}$

$F_x = 2x$

$F_y = 4y$

$F_z = -6z$

@ $(-2, -1, 1)$ $\rightarrow = -4$

$\rightarrow = -4$

$\rightarrow = -6$

D

$$\frac{x+2}{-4} = \frac{y+1}{-4} = \frac{z-1}{-6}$$

If $e^z = xyz$, then $\frac{\partial z}{\partial y} =$

(A) $\frac{e^z - xy}{xz}$

(B) $\frac{xz}{e^z - xy}$

(C) $\frac{xy}{e^z - xy}$

(D) $e^z - xy$

(E) $\frac{yz}{e^z - xy}$

Select one:

- A
- B
- C
- D
- E

$$e^z \cdot \frac{\partial z}{\partial y} = xy \cdot \frac{\partial z}{\partial y} + z \cdot x$$

$$\frac{\partial z}{\partial y}\left(e^z - xy\right) = xz$$

$$\frac{\partial z}{\partial y} = \frac{xz}{e^z - xy}$$

The parametric equations for the tangent line to the curve of $\vec{r}(t) = < t, t^2, t^3 >$ at the point $(3, 9, 27)$

A. $x = -1 + t;\ y = 1 - 2t;\ z = -1 + 3t$

B. $x = 1 + t;\ y = 1 + 2t;\ z = 1 + 3t$

C. $x = 3 + t;\ y = 9 + 6t;\ z = 27 + 27t$ ✔

D. $x = 2 + t;\ y = 4 + 4t;\ z = 8 + 12t$

E. $x = -2 + t;\ y = 4 - 4t;\ z = -8 + 12t$

The correct answer is:
$x = 3 + t;\ y = 9 + 6t;\ z = 27 + 27t$

$r(t) = \langle t, t^2, t^3 \rangle$ @ $(3, 9, 27)$

$r'(t) = \langle 1, 2t, 3t^2 \rangle$ $\underline{t = 3}$

$r'(3) = \langle 1, 6, 27 \rangle$

$x = 3 + t$, $y = 9 + 6t$, $z = 27 + 27t$ (c)

Parametric equations of the tangent line to the curve $\vec{r}(t) = \langle 3t, e^t, e^{-t} \rangle$ at $t = 0$ is

(A) $x = 3t,\ y = 1 + t,\ z = 1 + t$

(B) $x = 3 + 3t,\ y = 1 + t,\ z = 1 - t$

(C) $x = 3 + 3t,\ y = 1 + t,\ z = 1 + t$

(D) $x = 3 + 3t,\ y = 1 - t,\ z = 1 + t$

(E) $x = 3t,\ y = 1 + t,\ z = 1 - t$

- ○ (A)
- ○ (B)
- ○ (C)
- ○ (D)
- ◉ (E)

$r(t) = \langle 3t, e^t, e^{-t} \rangle$

$r(0) = (0, 1, 1)$

$r'(t) = \langle 3, e^t, -e^{-t} \rangle$

$r'(0) = \langle 3, 1, -1 \rangle$

$x = 3t$, $y = 1+t$, $z = 1-t$ E

The equation of the tangent plane to the surface $x^2 + 2y^2 - 3z^2 = 3$ at the point $(2, -1, 1)$ is

(A) $4(x-2) - 4(y+1) - 6(z-1) = 0$

(B) $4(x-2) + 2(y+1) - 3(z-1) = 0$

(C) $4(x+2) - 4(y+1) - 6(z+1) = 0$

(D) $2(x-2) - 1(y+1) + (z-1) = 0$

(E) $4(x-2)^2 - 4(y+1)^2 - 6(z-1)^2 = 0$

- (A)
- (B)
- (C)
- (D)
- (E)

$x^2+2y^2-3z^2=3$ @ $(2,-1,1)$

$F_x = 2x \rightarrow = 4$

$F_y = 4y$ @ $\rightarrow = -4$

$F_z = -6z \rightarrow = -6$

$4(x-2) - 4(y+1) - 6(z-1) = 0$ (A)

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Let $f(x, y) = x^4 + 5xy^3$. Find f_{xy}

(A) $5y^2$

(B) $15y^2$

(C) $5y$

(D) $15y$

(E) $12 + 15y^2$

Select one:

- A
- B
- C
- D
- E

$f(x,y) = x^4 + 5xy^3$

$f_x = 4x^3 + 5y^3$

$f_{xy} = 0 + 15y^2$ B

Question 6

Not yet answered

Marked out of 1.00

Flag question

The directional derivative of the function $f(x,y) = x^2e^{-y}$ at the point $(-3,0)$ in the direction of the vector $v = 3i + 4j$ is

A) $\frac{-18}{5}$

B) $\frac{-54}{5}$

C) $\frac{18}{5}$

D) $\frac{-36}{5}$

E) $\frac{4}{5}$

$$\vec{\nabla f} = \langle 2e^{y}x \quad , \quad -x^2e^{-y} \rangle \rightarrow @(-3,0) = \langle -6, \quad -9 \rangle$$

$$|\vec{v}| = \sqrt{9+16} = 5$$

$$\hat{v} = \frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}$$

$$\nabla f \cdot \hat{v} = \frac{-18}{5} - \frac{36}{5}$$

$$= \frac{-54}{5} \qquad B$$

If $\vec{\nabla} f(3,2) = \langle 10, -5 \rangle$ and $\vec{a} = \langle 3, -4 \rangle$, then

the directional derivative of f at $(3,2)$ in the direction of $\vec{a}$,
$D_{\vec{a}} f(3,2) =$

(A) $\frac{10}{\sqrt{5}}$

(B) $\frac{2}{\sqrt{5}}$

(C) 10

(D) 50

(E) $-\frac{2}{\sqrt{5}}$

(A)

(B)

(C)

(D)

(E)

$$\hat{a} = \left\langle \frac{3}{5}, \frac{-4}{5} \right\rangle$$

$$\nabla f \cdot \hat{a} = 6 - -4 = 10 \quad \text{(c)}$$

If $\vec{\nabla} f(-1,-2,3) = (1,-2,2)$, then

(A) The minimum directional derivative of the function f at the point $(-1,-2,3)$ is 3 , and it occurs in the direction of $(-1,-2,2)$

(B) The minimum directional derivative of the function f at the point $(-1,-2,3)$ is 3 , and it occurs in the direction of $(-1,2,-2)$

(C) The minimum directional derivative of the function f at the point $(-1,-2,3)$ is -3 , and it occurs in the direction of $(1,-2,2)$

(D) The minimum directional derivative of the function f at the point $(-1,-2,3)$ is -3 , and it occurs in the direction of $(-1,2,-2)$

(E) The maximum directional derivative of the function f at the point $(-1,-2,3)$ is -3 , and it occurs in the direction of $(-1,2,-2)$

- ( ) (A)
- ( ) (B)
- (•) (C)
- ( ) (D)
- ( ) (E)

max when $\theta = 0^\circ$ $\rightarrow |\vec{\nabla} f| = \sqrt{1+4+4} = 3$

min when $\theta = 180^\circ$ $\rightarrow -3$

D

10

Question *

(3 Points)

The critical points of $f(x, y) = x^3 - 3x + y^2 - 2y$ are

(A) $(1,1)$ and $(-1,-1)$

(B) $(1,1)$ and $(-1,1)$

(C) $(-1,1)$ and $(-1,-1)$

(D) $(1,-1)$ and $(-1,-1)$

(E) $(-1,-1)$ and $(-1,1)$

- (A)
- (B)
- (C)
- (D)
- (E)

$f_x = 3x^2 - 3 = 0$ $\quad x = \pm 1$ $\quad (1, 1)$

$f_y = 2y - 2 = 0$ $\quad y = 1$ $\quad (-1, 1)$ $\quad$ B

$f(x, y)$ has a continuous second partial derivatives at the point $(1,2)$:

$f_{xx}(1,2) = -3$, $f_{yy}(1,2) = 4$ and $f_{xy}(1,2) = 2$

then at $(1,2)$ f has

(A) Local maximum value

(B) Local minimum value

(C) Saddle point

(D) Inflection point

(E) 8 is the minimum value of the directional derivative of f

$$D = f_{xx} \cdot f_{yy} - f_{xy}^2$$

$$= -12 - 4$$

$$= -16$$, then saddle point (c)

Let $f(x, y) = y^2 - 2y\cos x$. Then

(A) f has a local minimum value at $\left(\frac{3\pi}{2}, 0\right)$

(B) f has a local maximum value at $\left(\frac{3\pi}{2}, 0\right)$

(C) $\left(\frac{3\pi}{2}, 0\right)$ is not a critical point of f.

(D) $\left(\frac{3\pi}{2}, 0\right)$ is a saddle point of f.

(E) $\left(\frac{3\pi}{2}, 1\right)$ is a critical point of f.

Select one:

- A
- B
- C
- D
- E

$f_x = 2y \sin x$

$f_y = 2y - 2\cos x \rightarrow y = \cos x$

$2 \sin x \cos x = 0$

$f_{xx} = 2y \cos x$

$f_{yy} = 2$

$f_{xy} = 2 \sin x$

sub$(3\pi/2, 0)$

$x = 0, \pi/2, \pi, 3\pi/2, 2\pi$

$y = 1, 0, -1, 0, 1$

$(3\pi/2, 0)$ is Critical

$D = f_{xx} f_{yy} - f_{xy}^2$

$= 0 \cdot 2 - (-2)^2$

$D = -4 \rightarrow$ saddle point (D)

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Suppose f is a differentiable function in x and y, and
$g(u, v) = f(u + v, u - v)$, where $x = u + v$ and $y = u - v$.
If $f_x(0, -2) = 1$, $f_y(0, -2) = 3$, then $g_u(-1,1) - g_v(-1,1) =$

(A) 4
(B) 6
(C) 2
(D) 1
(E) 3

Select one:

- A
- B
- C
- D
- E

$u = -1$

$v = 1$

$x = 0$

$y = -2$

$\frac{\partial x}{\partial u} = 1$

$\frac{\partial x}{\partial v} = 1$

$\frac{\partial y}{\partial u} = 1$

$\frac{\partial y}{\partial v} = -1$

$$\frac{\partial g}{\partial u} = \frac{\partial g}{\partial x} \cdot \frac{\partial x}{\partial u} + \frac{\partial g}{\partial y} \cdot \frac{\partial y}{\partial u}$$

$$1 \cdot 1 + 3 \cdot 1 = 4$$

$$\frac{\partial g}{\partial v} = \frac{\partial g}{\partial x} \cdot \frac{\partial x}{\partial v} + \frac{\partial g}{\partial y} \cdot \frac{\partial y}{\partial v}$$

$$1 \cdot 1 + 3 \cdot (-1) = -2$$

$$\frac{\partial g}{\partial u} - \frac{\partial g}{\partial v} = 4 - -2 = 6$$

B

To find the points on the cone $z^2 = x^2 + y^2$, that are closest to the point $(2, 4, 0)$, we need to solve these Lagrange equations

(A) $x - 2 = \lambda x,\ y - 4 = \lambda y,\ z = \lambda z,\ x^2 + y^2 - z^2 = 0.$

~~(B)~~ $\cancel{x + 2 = \lambda x},\ y + 4 = \lambda y,\ z = \lambda z, x^2 + y^2 - z^2 = 0.$

~~(C)~~ $\cancel{x + 4 = \lambda x},\ y + 2 = \lambda y,\ z = -\lambda z, x^2 + y^2 - z^2 = 0.$

~~(D)~~ $\cancel{x - 2 = \lambda x}, y - 4 = \lambda y\ , z = -\lambda z, x^2 + y^2 - z^2 = 0.$

(E) $x - 2 = \lambda x, y - 4 = \lambda y, z = -\lambda z, (x-2)^2 + (y-4)^2 - z^2 = 0.$

$f(x,y,z) = (x-2)^2 + (y-4)^2 + z^2$

$g(x,y,z) = x^2 + y^2 - z^2$ -- (4)

$2(x-2) = \lambda 2x$ .. (1)

$2(y-4) = \lambda 2y$ — (2)

$2z = -\lambda 2z$ — (3)

Divide (1),(2),(3) by 2

E

Using language multipliers method. The maximum value of $f(x, y, z) = xyz$, subject to the constraint

$$x^2 + y^2 + z^2 = 3 \text{ is}$$

(A) 1

(B) 2

(C) 6

(D) 4

(E) 8

$f(x,y,z) = xyz$

$g(x,y,z) = x^2+y^2+z^2=3$

$$\left.\begin{array}{l} yz = \lambda 2x \\ xz = \lambda 2y \\ xy = \lambda 2z \end{array}\right] \rightarrow \begin{array}{l} x^2 = y^2 \\ y^2 = z^2 \end{array} \rightarrow x^2 = y^2 = z^2 \rightarrow 9 \text{ possible points}$$

$f(1,1,1) = 1$ A

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The minimum value of the function $f(x, y) = 3x + y$ on the circle $x^2 + y^2 = 10$ is (Hint: use the Lagrange method)

A) 10 and -10

B) $-(6 + \sqrt{6})$ at $(-2, -\sqrt{6})$

C) 10 at $(3,1)$

D) -10 at $(-3, -1)$

E) $-4\sqrt{5}$ at $(-\sqrt{5}, -\sqrt{5})$

$f(x,y) = 3x+y$

$g(x,y) = x^2+y^2-10$

$$\left.\begin{aligned} 3 &= \lambda 2x \\ 1 &= \lambda 2y \end{aligned}\right] \to x = 3y \xrightarrow{\text{subing}} 10y^2 = 10$$

$y = \pm 1$

$x = \pm 3$

sub in f

$(3,1) \to 10$

$(3,-1) \to 8$

$(-3,1) \to -8$

$\boxed{(-3,-1) \to -10}$

D