$\langle -2, 0, 9 \rangle$

P3: $3(5+4t) = -9$

$5+4t = -3$

$4t = -8$

$t = -2$

$-(9-4)$ $\qquad$ $-(6-10)$

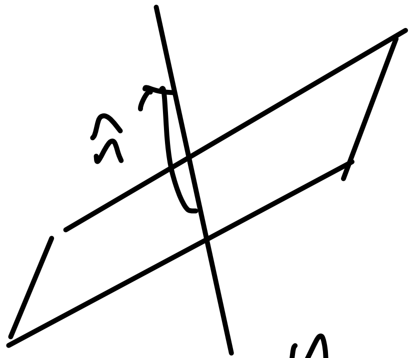
$= -5$ $\qquad$ $4$

$\langle -1, 1, 2 \rangle$

$x - y - 2z = 2$

$\langle 1, -1, -2 \rangle$

$v = \langle -1, 1, 2 \rangle$




$n \quad \langle 9, 9, 0 \rangle$

$1, -1, -2$

$\langle 0, -6, 3 \rangle$

$-1.5 - 1.5 + 6$

$-1 - 1 + 4$

$1y - 1x + 2z = -3$

$\langle -1, 1, 2 \rangle$

$\langle 2, -2, -4 \rangle$

$-2 - 2 + 8$

$\langle -1, 4, -4 \rangle$

$\langle -1, 5, -2 \rangle$

$$\begin{vmatrix} i & j & k \\ -1 & 4 & -4 \\ -1 & 5 & -2 \end{vmatrix} = \langle 12, 2, -1 \rangle$$

$\vec{r}'(t) = \langle 2t, -1, 4 \rangle$

$\vec{r}''(t) = \langle 2, 0, 0 \rangle$

$r(t) \cdot \vec{r}''(t)$

$\langle 36, -5, 24 \rangle \cdot \langle -6, -3, 5 \rangle$

$r(t) \cdot a(t)$

$= r'(t) \cdot a(t) + a'(t) \cdot r(t)$

$= \langle 2t, -1, 4 \rangle \cdot \langle -6, -3, 5 \rangle +$
$\langle -6, 9, 5 \rangle \cdot \langle t^2, 1-t, 4t \rangle$

$= \langle 12, -1, 4 \rangle \cdot \langle -6, -3, 5 \rangle +$
$\langle -6, 9, 5 \rangle \cdot \langle 36, -5, 24 \rangle$

$=$

$$\frac{d}{dt} r(g(t)) = r'(g(t))\,(g'(t))$$

$$= \frac{d}{dt}\langle e^{6t+8}, e^{18t+24}, 3\rangle (6)$$

$$= \langle 6e^{6t+8}, 18e^{18t+24}, 0\rangle (6)$$

$$= \frac{d}{dt} e^{6t+8},$$

$$\frac{d}{dt} e^{8} e^{6t}$$

$$= e^{8}\, 6e^{6t}$$

$$6e^{6t+8}$$

$$\vec{r'}(t) = \langle -\sin(t), 6\cos(6t), \cos(t) \rangle$$

$$\vec{r''}(t) = \langle -\cos(t), -36\sin(6t), -\sin(t) \rangle$$

$$\sin^2(t) + 36\cos^2(6t) + \cos^2(t)$$

distance = speed x time

$$= \int_0^4 |\vec{r'}(t)| \; dt$$

$$\vec{r'}(t) = \langle -7, 6, -4 \rangle$$

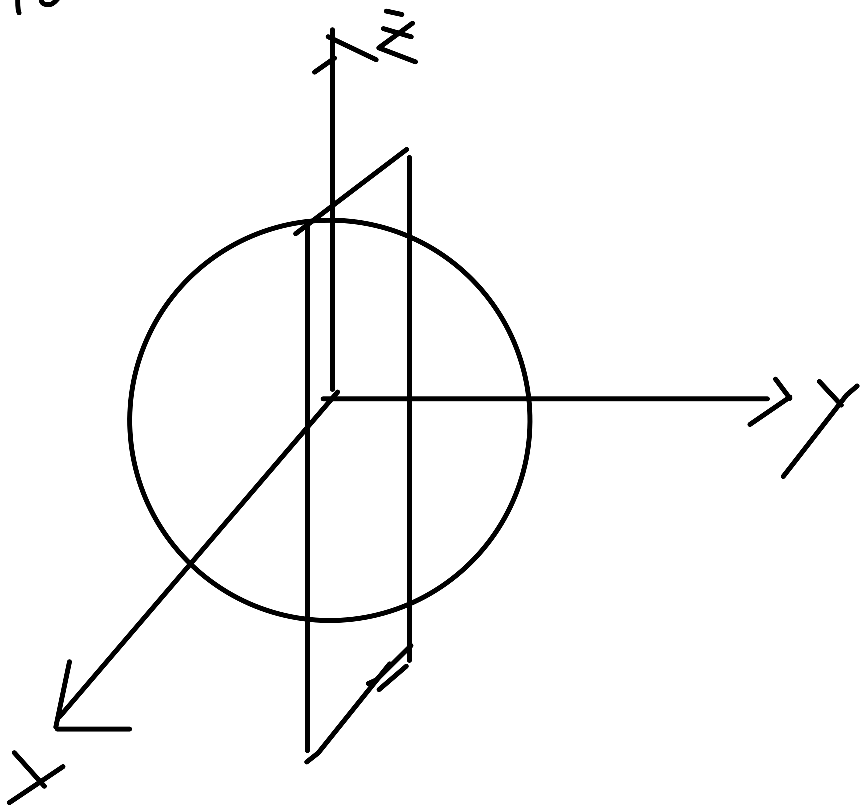
$$|\vec{r'}(t)| = \sqrt{49+36+16} = \sqrt{49+52} = \sqrt{101}$$

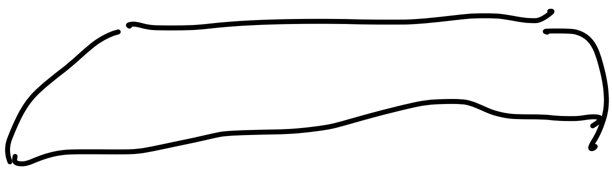
$$\int_0^4 \sqrt{101}$$

Made with Goodnotes

$$x^2 + 16 + z^2 = 116$$

$$x^2 + z^2 = 100$$



$$u(x,t) = t^{-2} e^{\frac{x^2}{2t}}$$

$$u_{xx} = \frac{\partial}{\partial x} u_x = \frac{\partial}{\partial x} t^{-2} \left(\frac{1}{2t}\right) e^{\frac{x^2}{2t}} \cdot 2x$$

$$= \frac{\partial}{\partial x} \frac{x}{t^3} e^{\frac{x^2}{2t}}$$

$$= \frac{1}{t^3} x \left(\frac{1}{2t} e^{\frac{x^2}{2t}} \cdot 2x\right) + e^{\frac{x^2}{2t}} \cdot \frac{1}{t^3}$$

$$= \frac{x}{t^3} \left(\frac{x}{t} e^{\frac{x^2}{2t}}\right) + \frac{1}{t^3} e^{\frac{x^2}{2t}}$$

$$\frac{d}{\partial y} \frac{y}{y-3x} = \frac{(y-3x) - y}{(y-3x)^2}$$

$$= \frac{-3x}{\phantom{(y-3x)^2}}$$

$F_{rst} = \frac{\partial}{\partial t}\frac{\partial}{\partial s}\frac{\partial}{\partial r} F$

$= (\cancel{8}s^3 + 8t^6)$

$= 24s^2$

$\frac{\partial}{\partial y} \sin(x^2 - 2y)$

$= \cos(x^2 - 2y) \cdot (-2)$

$= \cos(0 - 2\pi) \cdot (-2)$

$z = \ln(x^7 + y^5)$

$\frac{\partial z}{\partial x} \quad \frac{7x^6}{x^7 + y^5}$

$\frac{\partial}{\partial x} = \frac{(x^2+y^2) - x\left(\frac{x}{\sqrt{x^2+y^2}}\right)}{x^2+y^2}$

$\frac{x}{\sqrt{x^2+y^2}}$

$\frac{\partial}{\partial y} = \frac{-x\frac{y}{\sqrt{x^2+y^2}}}{x^2+y^2}$

$$F = (TU-V)^2 \ln(W-UV) - 1 = 0$$

$$\frac{\partial F}{\partial U} = \frac{\partial F}{\partial T} \cdot \frac{\partial T}{\partial U}$$

$$\frac{F_u}{F_T} = \frac{\partial T}{\partial U}$$

$$F_u = (TU-V)^2 \frac{1}{W-UV}(-V) + 2\ln(W-UV)(TU-V)(T)$$

T U V W

(7, 1, 8, 16)

$$= (7-8)^2 \frac{1}{16-8}(-8) + 2\ln(16-8)(7-8)(7)$$

$$= \frac{-1}{8} - 14\ln 8$$

$$= -1 - 14\ln 8$$

Made with Goodnotes

$$F = (TU-V)^2 \ln(W-UV)$$

$$F_T = (TU-V)^2 \left(\frac{1}{(W-UV)}\right)(0) +$$

$$\ln(W-UV)\, 2(TU-V)(U)$$

| T | U | V | W |
| --- | --- | --- | --- |
| 7 | 1 | 8 | 16 |

$$= (-1)^2 \frac{1}{8} +$$

$$2 \ln(8)\,(-1)(1)$$

$$= \qquad 2 \ln 8$$

Made with Goodnotes

$$\frac{\partial T}{\partial U} = \frac{\partial T}{\partial F} \cdot \frac{\partial F}{\partial u}$$

$$\frac{\partial T}{\partial V} = \frac{1}{F_T} \cdot F_u$$

$$\frac{\partial V}{\partial T} = \frac{\partial V}{\partial F} \cdot \frac{\partial F}{\partial T}$$

$$= \frac{1}{F_u} \cdot F_T$$

$$= \frac{F_T}{F_u}$$

$$\frac{\partial F}{\partial z} = \frac{\partial F}{\partial w} \cdot \frac{\partial w}{\partial z}$$

$$\frac{F_z}{F_w} = \frac{\partial w}{\partial z}.$$

$$F(x, y, z, w) = 0.$$

$$\frac{\partial}{\partial x} F \cdot \frac{\partial}{\partial y} F \cdot \frac{\partial y}{\partial x} \cdot \frac{\partial F}{\partial z} \ \partial$$

$$F_z = 2wz + 2y.$$

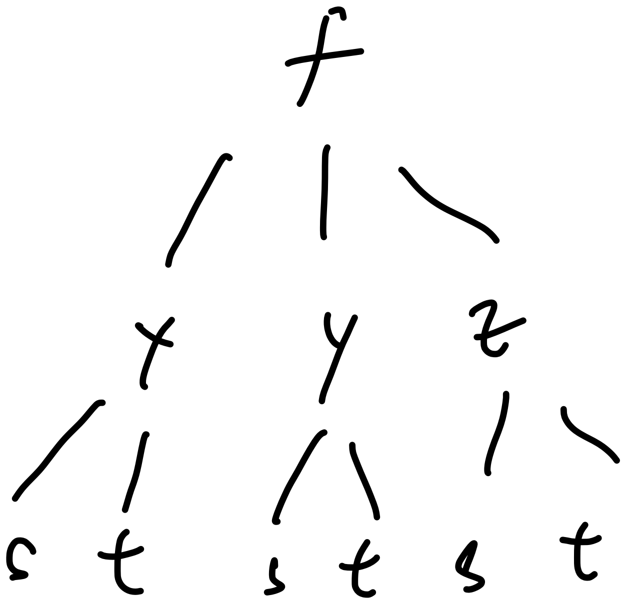
$$F_w = x^8 + 9w^8 + z^2$$

$$\frac{\partial w}{\partial z} = \frac{2(wz+y)}{x^8 + 9w^8 + z^2}$$

$$\begin{tikzcd}
 & & F \arrow[dll, no head] \arrow[dl, no head] \arrow[d, no head] \arrow[dr, no head] & \\
T & U \arrow[d, no head] & V \arrow[d, no head] & W \arrow[d, no head] \\
 & T & T & T
\end{tikzcd}$$

$$\frac{dF}{dT} = \frac{\partial F}{\partial T} + \frac{\partial U}{\partial T} + \frac{\partial V}{\partial T} + \frac{\partial W}{\partial T}$$

$$=$$




$$\frac{\partial f}{\partial s} = \frac{\partial f}{\partial x}\frac{\partial x}{\partial s} +$$

$$\nabla f: \; F_x = -\sin(4x^2+2y)(8x) +$$

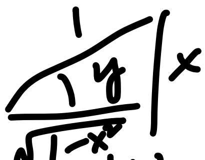
$$\cancel{\cos(4x^2+2y)(2}$$

$$F_y = -\sin(4x^2+2y)(2)$$

$\nabla f \cdot \hat{u} =$ $\hat{u} = \langle -1, 3 \rangle$

$$\hat{u} = \frac{\langle -1, 3 \rangle}{\sqrt{(-1)^2 + 3^2}}$$

$$\hat{u} = \left\langle -\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right\rangle$$




$\arcsin^{-1}(x)$

$= \frac{1}{\sqrt{1-x^2}}$

$$f_x = \frac{\sqrt{1-x^2y^2}}{xy} \cdot (y)$$

$y = \arcsin^{-1}(x)$

$\sin y = x$

$\cos y \cdot \frac{dy}{dx} = 1$

$$f_x = f_y = \frac{0.5\sqrt{1-0.25}}{0.25}$$

$= \frac{1}{\cos \cdot y}$

$$\frac{y}{\sqrt{1-x^2y^2}}$$

$0.25 \cdot 0.75$

$$\frac{dy}{dx} = \frac{1}{\frac{\sqrt{1-x^2}}{1}}$$

$$= \frac{1}{\sqrt{1-x^2}}$$

$$\frac{0.5}{\sqrt{0.75}}$$

$\nabla f.$

$$e^x + y + y^5 + 10 - z.$$

$f_x = e^x$

$f_y = 1 + 5y^4$

$f_z = -1$

$\nabla f(0, 4, 1039)$

$= \langle 1, 1281, -1 \rangle$

$$(e^x)x + (1 + 5(4)^4)y - z =$$

$$x + 1281y - z = (0) + 1281(4) - 1039$$

$$x + 1281y - z = 4085$$

$$-4085 = z$$

$\langle 5y, 5x+2y \rangle$

$\langle 5, 7 \rangle \cdot \langle \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \rangle$

$$\frac{x^4}{x^6+x^3} = \frac{x^4}{x^3(x^3+1)}$$

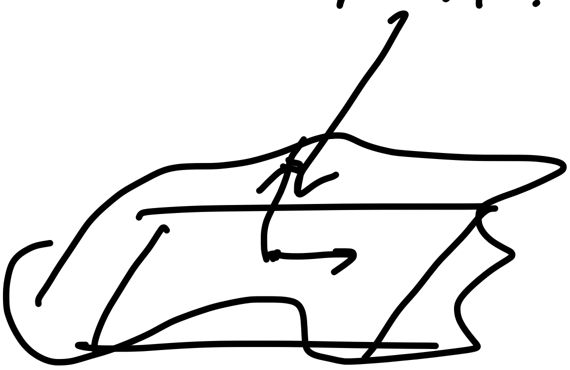
$$= \frac{x}{x^3+1}$$

$$\frac{x^4}{x^6+x^3} < x^4$$

$$\frac{x^6}{x^6+x^9}$$

$f_x = \sin(y)(e^x - 5)$

$f_y = \cos(y)\,(e^x - 5x)$

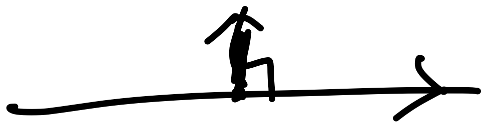



$z = f(x,y)$

$0 = f(x,y) - z$

$F_{x,y,z}$

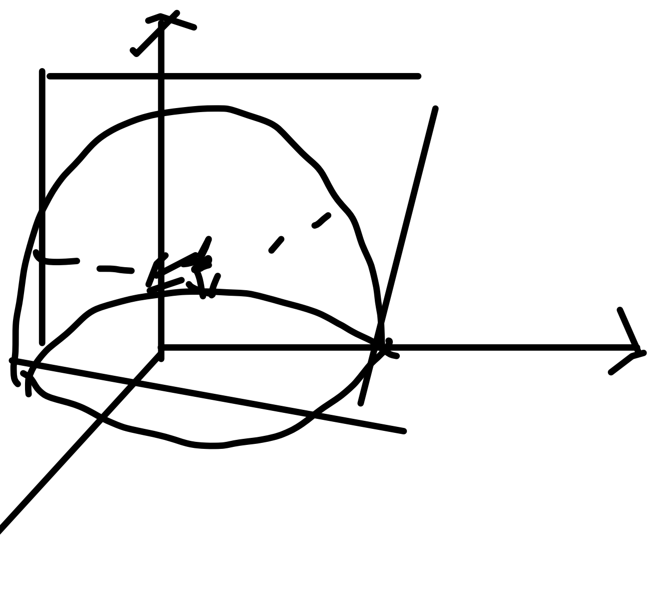
i j k



$\nabla f = \langle f_x, f_y, -1 \rangle$

$4(e^5 - 5)\sin 3 + \cos 3\,(e^5 - 25) + a(-1) = 0$

$a = a$



$$f_x = \begin{cases} 3x^2 - 18x = 0 \\ 3y^2 - 48 = 0. \end{cases}$$

$f_y =$

$x = 0$ or $3x - 18 = 0$

$x = 6$

$3y^2 = 48$

$y = \pm 4.$

Made with Goodnotes