SCCZ

Exam problem 1: compute the line integral.

$$\int_C yz\,dx + (xz+z)\,dy + (xy+y+1)\,dz.$$

over the path.

$$r(t) = \langle e^{t^3}, t^2e^{t^4}, te^{t^7} \rangle, \quad 0 \le t \le 1$$

Explain!

Ans: $dx = t^3e^{t^3-1}dt \quad dy = t^6e^{t^4-1}dt \quad dz = t^8e^{t^7-1}dt$

$$\int_0^1 t^2e^{t^4} \cdot te^{t^7} \cdot t^3e^{t^3-1}dt + (e^{t^3} \cdot te^{t^7} + te^{t^7}) \cdot t^6e^{t^4-1}dt$$
$$+ (e^{t^3} \cdot t^2e^{t^4} + t^2e^{t^4} + 1) \cdot t^8e^{t^7-1}dt.$$

$$= \int_0^1 t^6e^{t^4+t^7+t^3-1} + (te^{t^7+t^3} + te^{t^7}) \cdot t^6e^{t^4-1} + (t^2e^{t^4+t^3} + t^2e^{t^4} + 1)$$
$$\cdot t^8e^{t^7-1}$$

$$= \int_0^1 t^6e^{t^4+t^7+t^3-1} + t^7e^{t^7+t^3+t^4-1} + t^7e^{t^7+t^4-1} + t^{10}e^{t^7+t^4+t^3-1} + e^{10}e^{t^7+t^4-1} +$$
$$t^8e^{t^7-1}$$

$$= (1+e^2+e)/e.$$

Ans: $(1+e^2+e)/e$.

problem 1a. Compute the line integral

$$\int_C xe^{xyz}dx + ye^{xyz}dy + ze^{xyz}dz.$$

over the path. $r(t) = \langle t, t^2, t^3 \rangle, \quad 0 \le t \le 1.$

explain!

Ans: $dx = dt \quad dy = 2tdt \quad dz = 3t^2dt$

$$\int_0^1 t \cdot e^{t^6}dt + t^2e^{t^6} \cdot 2tdt + t^3e^{t^6} \cdot 3t^2dt = \int_0^1 e^{t^6}(t + 2t^3 + 3t^5)\,dt$$
$$\approx 2.31.$$

7. problem 16 compute the line integral

$$\int_C (4x^3y^2+1)\,dx + (2x^4y+1)\,dy,$$

over the path.

$$r(t) = \langle \sin t^2, \cos t^2 \rangle, \qquad 0 \le t \le \sqrt{\tfrac{\pi}{2}}.$$

Explain!

7. $dx = 2t\cos t^2\,dt \qquad dy = 2t \cdot -\sin t^2\,dt$

$$\int_0^{\sqrt{\frac{\pi}{2}}} (4\sin^3 t^2 \cdot \cos^2 t^2 + 1)\cdot(2t\cos t^2)\,dt + (2\cdot\sin^4 t^2 \cos t^2 + 1)\cdot (2t \cdot -\sin t^2)\,dt.$$

≈ 2.59

Ans: 2.59.

7 examproblem 2: By changing the order of integration, if necessary, evaluate the double-integral.

$$\int_0^6 \int_{(\frac{y}{6})^{\frac{1}{3}}}^1 \sin x^4\,dx\,dy$$

Here is what I did wrong (if applicable):

Ans: $\int_0^1\int_0^{5x^3} \sin x^4\,dy\,dx$

$= \int_0^1 5x^3 \sin x^4\,dx$

$= \frac{5}{4}\int \sin u\,du$

$= \frac{5}{4} -\cos u \,\Big|$

$= \frac{5}{4}\cdot(\cos{}^4 + \cos{}^4) = -\frac{5}{4}\cos 1 + \frac{5}{4}.$

Ans: $-\frac{5}{4}\cos 1 + \frac{5}{4}.$

7.problem 2a:

changing the order of integration

$$\int_0^1 \int_0^{e^x} f(x,y)\, dy\, dx$$

Ans: $$\int_0^e \int_{\ln y}^1 f(x,y)\, dx\, dy$$

7.problem 2b:

changing the order of integration

$$\int_0^{\pi} \int_0^{\sin x} f(x,y)\, dy\, dx$$

Ans: $$\int_0^1 \int_{\arcsin(y)}^{\pi} f(x,y)\, dx\, dy$$

7.problem 2c:

changing the order of integration

$$\int_0^1 \int_{e^y}^{e} f(x,y)\, dx\, dy$$

Ans: $$\int_0^e \int_0^{\ln x} f(x,y)\, dy\, dx$$

exam problem3 Find the equation of the tangent plane at the point $(1,1,1)$ to the surface given parametrically by

$x(u,v)=u^3v$, $y(u,v)=uv$, $z(u,v)=uv^3$,

$-\infty<u<\infty$, $-\infty<v<\infty$.

Express your answer in explicit form, i.e. in the format $z=ax+by+c$.

Ans: $f\_u=\langle 3u^2v, v, v^3\rangle$

$f\_v=\langle u^3, u, 3uv^2\rangle$

$u^3v=1$ $uv=1$ $uv^3=1$

$u=\pm1$ $v=\pm1$.

① $u=1$ $v=1$

$f\_u=\langle 3, 1, 1\rangle$ $f\_v=\langle 1, 1, 3\rangle$

$f\_u \times f\_v=\langle 2,-8,2\rangle=\langle 1,-4,1\rangle$

② $u=-1$ $v=-1$

$f\_u=\langle -3,-1,-1\rangle$ $f\_v=\langle -1,-1,-3\rangle$

$f\_u \times f\_v=\langle 1,-4,1\rangle$

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

$x-1-4y+4+z-1=0$

$\boxed{z=-x+4y-2}$

Ans: $z=-x+4y-2$.

problem 3a:

Find the equation of the tangent plane at the point $(1,2,4)$ to the surface given parametrically by

$x(u,v)=u^2,\quad y(u,v)=uv,\quad z(u,v)=v^2,$

$-\infty < u < \infty,\quad -\infty < v < \infty.$

express you answer in explicit form, i.e. in the format $z = ax+by+c$.

$u^2=1 \quad uv=2 \quad v^2=4$

$u=\pm 1 \quad v=\pm 2$

~~① u=1~~

$f_u = \langle 2u, v, 0\rangle$

$f_v = \langle 0, u, 2v\rangle$

① $u=+1 \quad v=+2$

$f_u = \langle 2, 2, 0\rangle \quad f_v = \langle 0, 1, 4\rangle$

$f_u \times f_v = \langle 8, 8, 2\rangle = \langle 4,4,1\rangle$

② $u=-1 \quad v=-2$

$f_u = \langle -2, -2, 0\rangle \quad f_v = \langle 0, -1, -4\rangle$

$f_u \times f_v = \langle 4,4,1\rangle$

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

$4x-4+4y-8+z-4=0$

$\boxed{z=-4x-4y+16}$

Ans: $z=-4x-4y+16$.

?Problem 3b. Find the equation of the tangent plane at the point $(-1,-1,2)$ to the surface ~~is~~ given parametrically by

$x(u,v)=u^3$, $y(u,v)=v^3$ $z(u,v)=-2uv$,

$-\infty < u < \infty$, $-\infty < v < \infty$.

Express you answer in explicit form, i.e in the format $z=ax+by+c$.

Ans: $u^3=-1$ $v^3=-1$ $-2uv=2$.

Exam problem 4.

Let $f(x, y, z) = e^{\cos x^2 + \sin xyz + \cos xz}$, and Let

$$F = \left\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \right\rangle$$

Let C be the curve

$$r(t) = \langle \cos t, t, \sin t \rangle \quad 0 \le t \le 2\pi.$$

Find the value of the line-integral

$$\int_C F \cdot dr$$

Explain! just giving the answer will give you no credit.

Ans: $F = \text{grad } f$

$\text{curl}(\text{grad } f) = \langle 0, 0, 0 \rangle$

conservative

$\therefore \int_C F \cdot dr = f(\text{end}) - f(\text{start})$

$r(0) = \langle 1, 0, 0 \rangle$

$r(2\pi) = \langle 1,$ [illegible] $0 \rangle$

$\int_C F \cdot dr = e^{\cos 1 + \sin 0 + \cos 0} - e^{\cos 1 + \sin 0 + \cos 0}$

$= 0.$

Ans: 0

Problem 4a

Let $f(x,y,z) = \sin(x+y^2+z^3)$, and let

$$F = \langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \rangle$$

Let C be the curve

$$r(t) = \langle t, t^2, t^3 \rangle, \quad 0 \le t \le 3$$

Find the value of the line-integral

$$\int_C F\,dr$$

Explain! just giving the answer will give you no credit.

Ans: $F = \text{grad} f$

$\text{curl}(\text{grad} f) = \langle 0,0,0 \rangle$

conservative.

$\int_C F\,dr = f(\text{end}) - f(\text{start})$

$r(0) = \langle 0,0,0 \rangle$

$r(3) = \langle 3, 9, 27 \rangle$

$\int_C F\,dr = \sin(3+81+(27)^3) - \sin(0)$

$= \sin(19767)$

Ans: $\sin(19767)$

problem 4b Let $f(x,y) = e^{\cos x + 3\sin y}$, and Let

$$F = \langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y} \rangle$$

Let c be the curve

$$r(t) = \langle \sin 2t, \cos t \rangle \quad 0 \le t \le \pi .$$

Find the value of the line-integral

$$\int_C F dr$$

Explain! just giving the answer will give you no credit.

Ans: $F = \text{grad } f$

$\text{curl}(\text{grad } f) = \langle 0,0 \rangle$

conservative.

$\int_C F dr = f(\text{end}) - f(\text{start})$

$r(0) = \langle 0, 1 \rangle$

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

$$\int_C F dr = e^{\cos 0 + 3\sin -1} - e^{\cos 0 + 3\sin 1}$$

$$= \cancel{\cos}\ e^{1+3\sin(-1)} - e^{1+3\sin 1}.$$

exam problem5 Evaluate the triple integral

$$\int_R (x^2+y^2+z^2)^3 \, dx\,dy\,dz$$

where R is the region in 3D space given by

$$\{(x,y,z) \mid x^2+y^2+z^2 \le 1, \ x,y,z \ge 0\}.$$

Ans:

$$\{(r,t,f) \mid r=0..1, \ t=0..\tfrac{\pi}{2}, \ f=0..\tfrac{\pi}{2}\}$$

$$\int_0^{\frac{\pi}{2}}\int_0^{\frac{\pi}{2}}\int_0^1 \left((r\sin f\cos t)^2+(r\sin f\sin t)^2+(r\cos f)^2\right)^3 \cdot r^2\sin f \, dr\,dt\,df.$$

$$= \frac{\pi}{18}$$

Ans: $\frac{\pi}{18}$

?problem 5a evaluate the triple integral

$$\int_R (x+y)(x^2+y^2+z^2)^2 \, dx\,dy\,dz$$

where R is the region in 3D space given by

$$\{(x,y,z) \mid x^2+y^2+z^2 \le 1, \ x \ge 0, y<0, z<0\}.$$

Ans:

$$\{(r,t,f) \mid r=0..1, \ t=\tfrac{3}{2}\pi..2\pi, \ f=\tfrac{\pi}{2}..\pi\}$$

$$\int_{\frac{\pi}{2}}^{\pi}\int_{\frac{3}{2}\pi}^{2\pi}\int_0^1 (r\sin f\cos t+r\sin f\sin t)\left((r\sin f\cos t)^2+(r\sin f\sin t)^2+(r\cos f)^2\right)^2 \cdot r^2\sin f \, dr\,dt\,df.$$

$$=0.$$

problem 5b evaluate the triple integral

$$\int_R z(x^2+y^2+z^2)\,dx\,dy\,dz$$

where R is the region in 3D space given by

$$\{(x,y,z) \mid x^2+y^2+z^2<1,\ y<0\}$$

Ans:

$$\{(r,t,f) \mid r=0..1\quad t=\pi..2\pi,\ f=0..\pi\}$$

$$\int_0^{\pi}\int_{\pi}^{2\pi}\int_0^1 r\cos f\,\left((r\sin f\cos t)^2+(r\sin f\sin t)^2+(r\cos f)^2\right)\cdot r^2\sin f\,dr\,dt\,df.$$

$$= \frac{\pi}{6}$$

problem 5c evaluate the triple integral

$$\int_R (z-x)\,dx\,dy\,dz$$

where R is the region in 3D space given by

$$\{(x,y,z) \mid x^2+y^2+z^2\le 8\}$$

$$\{(r,t,f) \mid r=0..\sqrt{8},\quad t=0..2\pi,\ f=0..\pi\}$$

$$\int_0^{\pi}\int_0^{2\pi}\int_0^{\sqrt{8}} (r\cos f - r\sin f\cos t)\cdot r^2\sin f\,dr\,dt\,df.$$

$$= 32\pi$$

exam problem 6 Evaluate the double integral

$$\int_{-3}^{0}\int_{0}^{\sqrt{9-x^2}} (x^2+y^2)^2 \, dy\, dx$$

$$\cancel{\int_{0}^{3}\int_{-\sqrt{9-y^2}}^{0}}$$

$\{(r,\theta) \mid r=0..3 \quad \theta=\frac{\pi}{2}..\pi\}$

$$\cancel{\int_{\frac{\pi}{2}}^{\pi}\int_{0}^{3} r^2 \cdot r \, dr\, d\theta} \qquad \int_{\frac{\pi}{2}}^{\pi}\int_{0}^{3} r^5 \, dr\, d\theta$$

$$\cancel{= \int_{\frac{\pi}{2}}^{\pi}\int_{0}^{3} r^3 \, dr\, d\theta} \qquad = \frac{243}{4}\pi.$$

$$\cancel{= \int_{\frac{\pi}{2}}^{\pi} \frac{1}{4} r^4 \Big|_0^3 \, d\theta}$$

$$\cancel{= \frac{81}{4}\cdot\frac{\pi}{2}}$$

$$\cancel{= \frac{81}{8}\pi}$$

problem 6a: convert the integral to polar coordinates, do not evaluate

$$\int_{-3}^{0}\int_{0}^{\sqrt{9-x^2}} (x^2+y) \, dy\, dx$$

$\{(r,\theta) \mid r=0..3 \quad \theta=\frac{\pi}{2}..\pi\}$

Ans: $\int_{\frac{\pi}{2}}^{\pi}\int_{0}^{3} ((r\cos\theta)^2 + r\sin\theta)\, r \, dr\, d\theta$

... line integral $\int_C f\,ds$ where ...

Problem 6b: convert the integral to the polar coordinates, do not evaluate

$$\int_0^4 \int_{-\sqrt{16-x^2}}^0 (x^2+y)\,dy\,dx$$

$$\{(r,\theta) \mid r = 0..4 \quad \theta = \tfrac{3}{2}\pi .. 2\pi\}$$

$$\text{Ans: } \int_{\frac{3}{2}\pi}^{2\pi} \int_0^4 \left((r\cos\theta)^2 + r\sin\theta\right) \cdot r\,dr\,d\theta$$

?problem 6c: convert the integral to polar coordinates do not evaluate.

$$\int_{-\frac{\sqrt{2}}{2}}^{\frac{\sqrt{2}}{2}} \int_x^{\sqrt{1-x^2}} (x^3+y^2)\,dy\,dx$$

$$\text{Ans: } \cancel{\int_0 \int_0^{\frac{\sqrt{2}}{2}}}$$

Exam Problem 7 Decide whether the following limits exist. If it does find them. If it does not explain why not?

(a) $\displaystyle\lim_{(x,y)\to(\frac{\pi}{2},\frac{\pi}{2})} \frac{\cos x + \sin x}{x+y}$ (b) $\displaystyle\lim_{(x,y)\to(0,0)} \frac{x^2-y^2}{x-y}$

(c) $\displaystyle\lim_{(x,y)\to(0,0)} \frac{x-y}{x^2-y^2}$ (D) $\displaystyle\lim_{(x,y)\to(1,1)} \frac{x+y-2}{2x+y-3}$

(a) $\dfrac{\cancel{\cos}\,0+1}{1} = 1.$ (b) $\dfrac{(x+y)\cancel{(x-y)}}{\cancel{x-y}} = x+y = 0$

(c) $\dfrac{\cancel{x-y}}{(x+y)\cancel{(x-y)}}$ = does not exist. (D) $(x,1)$ $\dfrac{x-1}{2x-2} = \dfrac{1}{2}$ does not exist.

$(1,y)$ $\dfrac{y-1}{y-1} = 1$

problem 7a: Decide whether the following limit exists. If it does, find it, if not, explain!

$$\lim_{(x,y)\to(1,3)} \frac{x-1}{y-3}$$

$(x,3)$ $\frac{x-1}{\cancel{\neq} 0}$ ~~does not~~ undefine.

$(1,y)$ $\frac{0}{y-3} = 0$

does not exist.

problem 7b: Decide whether the following limit exists. If it does, find it, if not, explain!

$$\lim_{(x,y,z)\to(0,0,0)} \frac{x+y+2z}{2x+y+z}$$

$(x,0,0)$ $\frac{x}{2x} = \frac{1}{2}$

$(0,y,0)$ $\frac{y}{y} = 1$

$(0,0,z)$ $\frac{2z}{z} = 2$

does not exist.

Exam problem 8: compute the line integral $\int_C f\,ds$ where

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

and C is the line segment starting at $(0,0,0)$ and ending at $(1,2,-3)$

line: $\langle t, 2t, -3t\rangle$ $0 \le t \le 1$

$ds = \sqrt{1+4+9} = \sqrt{14}$

$\int_0^1 -6t^3\sqrt{14}\,dt$

$= -\frac{3}{2}\sqrt{14}$. Ans: $-\frac{3}{2}\sqrt{14}$.

problem 8a: Compute the line integral $\int_C f ds$ where

$$f(x,y,z) = xy^2 + yz^2 + z$$

and C is the line segment starting at (0,0,0) and ending at (1,1,-1)

$$r(t) = \langle t, t, -t \rangle \quad 0 \le t \le 1.$$

$$ds = \sqrt{1+1+1} = \sqrt{3}\, dt$$

$$\int_0^1 (t^3 + t^3 - t)\sqrt{3}\, dt$$

$$= \int_0^1 \sqrt{3}t^3 + \sqrt{3}t^3 - \sqrt{3}t\, dt$$

$$= \frac{\sqrt{3}}{4}t^4 + \frac{\sqrt{3}}{4}t^4 - \frac{\sqrt{3}}{2}t^2 \Big|_0^1$$

$$= \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{2}$$

$$= 0$$

Ans: 0

problem 8b: Compute the line integral $\int_C f\, ds$ where

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

and C is the upper circle $\{(x,y): x^2+y^2=1, y>0\}$.

$\{(r,\theta) \mid r = 0..1 \quad \theta = 0..\pi\}$.

$$\int_0^\pi \int_0^1 (r\cos\theta + r\sin\theta) r\, dr\, d\theta$$

Ans: $\frac{2}{3}$.

$$= \int_0^\pi \int_0^1 r^2\cos\theta + r^2\sin\theta\, dr\, d\theta$$

$$= \int_0^\pi \frac{1}{3}r^3\cos\theta + \frac{1}{3}r^3\sin\theta \Big|_0^1 d\theta$$

$$= \int_0^\pi \frac{1}{3}\cos\theta + \frac{1}{3}\sin\theta\, d\theta = \frac{1}{3}\sin\theta - \frac{1}{3}\cos\theta \Big|_0^\pi$$

$$= (0 + \tfrac{1}{3}) - (0 - \tfrac{1}{3}) = \tfrac{1}{3} + \tfrac{1}{3} = \tfrac{2}{3}.$$

Exam problem 9: compute the vector field surface integral $\iint_S F \cdot ds$ if F is

$$F = \langle z, z, x \rangle$$

and S is the oriented surface.

$$z = 9 - x^2 - y^2, \quad x \geq 0, \quad y \geq 0, \quad z \geq 0.$$

with downward pointing normal.

Here is what I did wrong (if applicable): ☆ be carefully for region.

$$\iint_S F \cdot ds = \iint_D \left(-P \frac{dg}{dx} - Q \frac{dg}{dy} + R \right) dA.$$

since downward pointing.

$$\iint_S F \cdot ds = -\iint_D \left(-P \frac{dg}{dx} - Q \frac{dg}{dy} + R \right) dA.$$

$$\frac{dg}{dx} = -2x \qquad \frac{dg}{dy} = -2y$$

$$\iint_S F \cdot ds = -\int_0^3 \int_0^{\sqrt{9-x^2}} (2xz + 2yz + x)\, dy\, dx$$

$$= -\int_0^3 \int_0^{\sqrt{9-x^2}} \left(2x(9-x^2-y^2) + 2y(9-x^2-y^2) + x \right) dy\, dx$$

$$= -\frac{693}{5}$$

problem 9a compute the vector-field surface integral $\iint_S F\,dS$ if F is

$$F = \langle x+z,\ y+z,\ -x \rangle$$

and S is the oriented surface.

$$z = 9-x^2-y^2, \quad x<0,\ y<0,\ z \geq 0.$$

with upward pointing normal.

Ans: $\iint_S F\,dS = \iint_D \left(-P\frac{\partial g}{\partial x} - Q\frac{\partial g}{\partial y} + R\right) dA$

$$\frac{\partial g}{\partial x} = -2x \qquad \frac{\partial g}{\partial y} = -2y$$

$$\int_{-3}^{0}\int_{-\sqrt{9-x^2}}^{0} (2x^2+2xz+2y^2+2yz-x)\,dy\,dx$$

$$= -\frac{603}{6} + \frac{81}{4}\pi$$

problem 9b: compute the vector-field surface integral $\iint_S F\cdot dS$ if F is

$$F = \langle x+z,\ y+z,\ -x \rangle$$

and S is the oriented surface

$$z = 9-x^2-y^2, \quad 0<x<1,\ 0<y<1,\ z \geq 0.$$

with downward pointing normal.

Examproblem 10 Find the point on the plane $x+2y+3z=18$ where the function $f(x,y,z)=xyz$ is as large as possible.

Here is what I did wrong (if applicable):

goal function: $f(x,y,z)=xyz$

constrain function: $g = x+2y+3z$

$\text{grad} f = L \cdot \text{grad} g$

$\langle yz, xz, xy \rangle = L \cdot \langle 1, 2, 3 \rangle$

$yz = L$

$xz = 2L$

$xy = 3L$

$x+2y+3z=18$

$\frac{x}{y} = 2$

$x = 2y$

$\frac{y}{z} = \frac{3}{2}$

$2y = 3z$

$x = 2y = 3z$

$3x = 18$

$x = 6$

$y = 3$

$z = 2$

point $\langle 6, 3, 2 \rangle$

value: 36

I know you only ask point.

problem 10a: Find the maximum value of the function $f(x,y,z)=xyz$ on the plane $2x+y+z=4$.

goal function $f=xyz$

constrain function: $g=2x+y+z$.

grad $f = L \cdot$ grad g

$\langle yz, xz, xy\rangle = L\cdot\langle 2,1,1\rangle$

$yz=2L$. $\quad \frac{y}{x}=2$

$\quad y=2x$

$xz=L$.

$xy=L$. $\quad z=\cancel{\ }y=2x$

$\frac{z}{y}=1$

$z=y$

$2x+y+z=4 \qquad$ value: $\frac{4}{3}\times\frac{4}{3}\times\frac{2}{3}=\frac{32}{27}$.

$3y=4 \qquad$ point $\langle\frac{2}{3},\frac{4}{3},\frac{4}{3}\rangle$.

$z=y=\frac{4}{3}$

$x=\frac{2}{3}$. $\qquad$ I know you ask value.

problem 10b Find the point on the plane $2x+y+z=4$ where $f(x,y,z)=xy^2z$ is as large as possible (you can use maple).

Ans:

grad $f = L \cdot$ grad g

$\langle y^2z, 2xyz, xy^2 \rangle = L \cdot \langle 2, 1, 1 \rangle$

$y^2z = 2L$

$2xyz = L$

$xy^2 = L$

$2xy^2 = 2L$

$2xy\cancel{z}2x = L$

$4x^2y = L$

$xy^2 = L$

$\cancel{y = \frac{L}{4x^2}}$

$\frac{y}{2x} = 2$

$y = 4x$

$= 2$

$2x+y+z=4$

$\frac{z}{x} = 2$

$z = 2x = 1$

$2x+4x+2x=4$

$8x = 4$

$x = \frac{1}{2}$

point $\langle \frac{1}{2}, 2, 1 \rangle$

value: 2

I know you ask point