UNIVERSITY OF ASIA PACIFIC

CSE-4.1

18101009

HASAN TAHSIN RAFSAN

A SECTION ROLL: 9

CLASS TEST 1

CSE - 401

8 AUGUST 2021

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Day

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18101009 P-1

Ans: 1

My id = 18101009

a = id mod 3 + 2 = 4

b = id mod 5 + 3 = 7

c = id mod 7 + 4 = 7

so, here function.

$F(x,y,z) = ax + by + cz$

$= 4x + 7y + 7z$

constraint $\Rightarrow x^2 + y^2 + z^2 = 6$,

$\Rightarrow x^2 + y^2 + z^2 - 6 = 0$

lagrang Multiplier Method

$h(x,y,z) - \lambda * g(x,y,z) = 0$ — (1)

$\Rightarrow 4x + 7y + 7z - \lambda * (x^2 + y^2 + z^2 - 6) = 0$

$\Rightarrow 4x + 7y + 7z - \lambda x^2 - \lambda y^2 - \lambda z^2 + 6 = 0$

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Now.. partially derivative w.r.to x

$4 + 0 + 0 - 2\lambda x - 0 - 0 + 0 = 0$

$\Rightarrow 4 - 2\lambda x = 0$

$\Rightarrow 4 = 2\lambda x$

$\Rightarrow x = \frac{4}{2\lambda}$ ——————

w.r.to y.

$0 + 7 + 0 - 0 - 2\lambda y - 0 + 0 = 0$

$\Rightarrow 7 - 2\lambda y = 0$

$\Rightarrow 7 = 2\lambda y \Rightarrow y = \frac{7}{2\lambda}$ ——————

w.r.to z.

$0 + 0 + 7 - 0 - 0 - 2\lambda z + 0 = 0$

$\Rightarrow 7 - 2\lambda z = 0 \Rightarrow 7 = 2\lambda z \Rightarrow z = \frac{7}{2\lambda}$ ——

Now, constraint — $x^2 + y^2 + z^2 = 6$

$\Rightarrow \left(\frac{4}{2\lambda}\right)^2 + \left(\frac{7}{2\lambda}\right)^2 + \left(\frac{7}{2\lambda}\right)^2 = 6$

$\Rightarrow \frac{16}{4\lambda^2} + \frac{49}{4\lambda^2} + \frac{49}{4\lambda^2} = 6$

$\Rightarrow \frac{114\ 57}{4\lambda^2} = 6$

$\Rightarrow \frac{57}{2\lambda^2} = 6$

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$\Rightarrow 12\lambda^2 = 57$

$\Rightarrow \lambda^2 = \frac{57}{12}$

$\Rightarrow \lambda = \pm \frac{57}{12}$

when, $\lambda = \frac{57}{12}$, then.

$x = \frac{4}{2\lambda} = \frac{4}{2 * \frac{57}{12}} = \frac{8}{19}$

$y = \frac{7}{2\lambda} = \frac{7}{2 * \frac{57}{12}} = \frac{14}{19}$

$z = \frac{7}{2\lambda} = \frac{14}{19}$

when $\lambda = -\frac{57}{12}$ then.

$x = \frac{4}{2\lambda} = \frac{4}{2 * -\frac{57}{12}} = -\frac{8}{19}$

$y = \frac{7}{2\lambda} = \frac{7}{2 * -\frac{57}{12}} = -\frac{14}{19}$

$z = \frac{7}{2\lambda} = \frac{-14}{19}$

So, we get

$\lambda = \frac{57}{12}$ $(x, y, z) = \left(\frac{8}{19}, \frac{14}{19}, \frac{14}{19}\right)$

$\lambda = \frac{-57}{12}$ $(x, y, z) = \left(\frac{-8}{19}, \frac{-14}{19}, \frac{-14}{19}\right)$ } Ans

Now, our objective function.

$f(x, y, z) = ax + by + cz$ where.

$a = 4, b = 7, c = 7$.

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So, $F(x, y, z) = 4x + 7y + 7z$.

$F\left(\frac{8}{19}, \frac{14}{19}, \frac{14}{19}\right) = 12$ (Maximum)

$F\left(-\frac{8}{19}, -\frac{14}{19}, -\frac{14}{19}\right) = -12$ (Minimum)

~~So, Maximum value is 12 (Ans)~~

So, the maximum value is 12 (Ans)