To find three planes in 3-D space that are pairwise orthogonal (perpendicular) & intersect at (5, 7,4) ER3

Let consider three normal vectors \vec{n}_1 , \vec{n}_2 ξ , \vec{n}_3 ξ the point of intersection as P(5,7,4) = (a,b,c)

since, it is given as that the planes are pairwise orthogonal, so, he dot products between the normal vectors are zero.

i.e., $\vec{n}_1 \cdot \vec{n}_2 = 0$ $\vec{n}_1 \cdot \vec{n}_3 = 0$ $\vec{n}_1 \cdot \vec{n}_3 = 0$ $\vec{n}_2 \cdot \vec{n}_3 = 0$ $\vec{n}_3 \cdot \vec{n}_3 = 0$ $\vec{n}_4 \cdot \vec{n}_4 \cdot \vec{n}_4 \cdot \vec{n}_5 \cdot \vec{n}_6 \cdot \vec{$

* for plane 1; Consider a simple plane whose normal vector is along x-axis.

normal vector in = (1,0,0) = (A,B,C) from point-normal equation.

A(x-a) + B(y-b) + C(z-c) = 0. I(x-5) + 0 + 0 = 0

x - 5 = 0 (0) $\times (0,0,1) = N$

Equation of plane 1 1 is x-15=0).

to the place (1,0,0) is taken as the normal vector because, any nonzero vector that is orthogral. (perpendicular) to the plane can be considered as he normal vector. Employee with mormal vector.

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or for plane 2; we need to consider a normal vector that is orthogonal to $\vec{n}_i = (1,0,0)$ and along the y-axis.

from point-normal equation,

> y-7=0 = 5.50 : Equation of plane 2 is y-7=0

* for plane 3, we need to consider a normal vator that is orthogonal to mi = (1,00) & mi = (0,1,0) and along z-axis.

to get \vec{n}_3 . mortages bornon-triog most

 $\vec{n}_3 = \vec{n}_1 \times \vec{n}_2$ 0 = (0 - x) + (d - y) + (0 - x) A

 $\vec{n}_{3} = (1,0,0) \times (0,1,0) \times (2-x)1$

n3 = (0,051) = (A, B, c) (2) morrison

from point mornal Cquation

because any non0=(4,25)1 +00+0 Acquel
(perfections) to the plo=4-5be princhal as

i. The Equation of plane 3 is z-4=000 st

:. The Equation are; x-5=0, y-7=0

& Z-4 =0

a) are linear, then the parametric curve describes a straight line in space.

The above statement is true.

If the component function of a parametric curve on shear, each component has the form f(t) = A + t B, g(t) = C + t D, h(t) = E + Fwhen these to linear components are used as the components of a parametric curve

or (t) = (flt), g(t), h(t)> the rusulting curve

the symmetric equation of a line is given by.

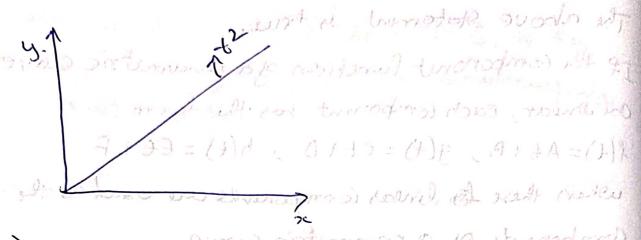
The combination of all three linear equations.

describes a straight line in 3-D space.

b) If a parametric curve describes a Straight und In Space, then its component functions are linear. The above Statement in false. As previously use sow it is true that a parametric curve with linear from Component function discribes a straight line in space, the vice-versa may not be necessarily true because the parametric curve that discribes a straight line in space can have a non-linear components functions.

Such as $\Re(4) = (4^2, 4^3, 4)$.

a Straight line hos hos slope equal to zero but the component functions are quadratic q Cubic with different slopes.



Curve are quadratic, then the parametric airve describes a parabola in Space.

the Above Statement is True. Each Component function has form $f(t) = At^2 + Bt + Cs$ 9(t) = Dt² + Et + F & h(t) = Gt² + Ht + I

in the parametric curve $\Re = (I(t), g(t), h(t))$ where, A, B, C, D, E, F, G, H, & I are constants.

The resulting curve is a parabola in

3-D Space. Here, Each components quadratic

Equation represents the point's position on the parabola as function of 't'.

house that discribes a stronglit line in space com house a moon-timed Compositions from those

such as 3(4) = (42, 43, 67.

(3) To fird the tangent line to the parametric course
$$\Re(t) = (\cos t, t + 1, \sin t)$$
 at the point $(1, 0)$.

derivative of $\Re(t)$ is

 $\Re(t) = (-\sin t, 1, \cos t)$

to fird the value of t :

we know, $\Re(t) = (\cos t, t + 1, \sin t)$

equate $\Re(t) = (1, 0)$

so, $\cos t = 1$
 $t+1 = 1$
 $\sin t = 0$

Solving for the from the above equation,

 $\cos t = 1 \Rightarrow t = 0$
 $\sinh t = 0 \Rightarrow t = 0$

Cublishing $\Re(t)$ & $\Re(t)$ at $t = 0$
 $\Re(t) = (\cos 0, 0 + 1, \sin 0) = (1, 1, 0)$
 $\Re(t) = (\sin 0, 1, \cos 0) = (0, 1, 1)$

Equation of the tangent line in vector form, can be written using $\Re(0)$ & $\Re(0)$ & $\Re(0)$
 $\Re(t) = \Re(0) + t \Re(0)$
 $\Re(t) = (1, 1, 0) + t \Re(0)$
 $\Re(t) = (1, 1, 0) + t \Re(0)$

So, the equation of the tangent line to The parametric curve x(t) = (cost, t+1, sin t) at point (1,1,0) is given by (3) to be suitavisate Z(t) = (1, 1+6, 4) (1, 1002) = (4)/2 where, x(t)=1, y(t)=1+t & 2(t)=t. (O(11) = (9) se stange From the House Books will month of rolling the D= + < 1 + do C-1 = 1 = 1+1 SINT -0 3 - 4 = 0 0-3-10 (A) (E 13 (A) (E pri-Laulois) \$(0) = ((0,0) 0+1) SINO) = (1,1,0) (100) = (000) (1000) = (016) Equation & the tongent has in victor form, was (0) % p (0) 50 Brico no office 90 [(E) = 5(0) + + 5(0) (0) \$ 3 (0) \$ Co melow it Tut't while (10.0) + to (1) = (1) 5 (* () + ()) = ()) j

- (a) given two parametric curves $\widehat{\mathcal{F}}(t) = \langle t, 1+2t, 3-2t \rangle$ $\widehat{\mathcal{F}}(t) = \langle -2-2t, 1-2t, 1+t \rangle$
 - a) To check for Collision of the points, we need to equate the points of the two curves. Then solve for it. If there are values by it that make both equation true, then the two points collide clse they do not collide.

Now, let cquate the curve's components & check for collision

$$t = -2 - 2t$$
, $1+2t = 1-2t$, $3-2t = 1+t$.
 $3t = -2$, $4t = 0$, $3t = 2$
 $\boxed{t = -2 \over 3}$, $\boxed{t = 0}$, $\boxed{t = 2 \over 3}$.

So, there are walues of t where the positions of a points are equal irrespective of their mognitude. Hence, the points do, callide at, the above mentional time instances.

b) To check for crossing of their paths, equate the components of the unves, then solve for it! If there are value of it! where the position of two curves are equal, then the paths cross the they do not cross.

here, we found out 't values to be t=-= , t=0, t== 15th + 10 (1) therfore, their paths also do not cross, as they never occupy the same point simultaneously inall three dimensions much both equation true than the transpoints collide else thought or collide: Show & the control of control & shock mo gwa rot 1426=1-2七) 36 = -2 , AE = 0 , 1-6=3-1 1=2/1/6=0 Is Bushing of when you well of the positions of it A THERESTER PROPERTY PROPERTY PROPERTY OF THE Horry, the polyte do, Tellicle in the above martind Hyra Inchance to check for corrience of their parthy equals the 1 J's at gold nest a sun of the structures. to there are value of it is allow are with the fore wines are fored.) they the parties oracs war torok 15th 28