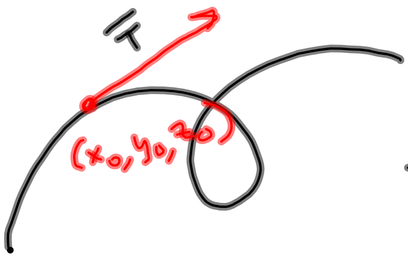
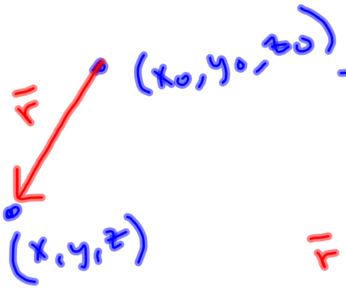


Normal Plane.

$\bar{T} = \langle a, b, c \rangle$ = normal to plane $= \bar{n}$



$a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$

If (x, y, z) is a point in the plane, then

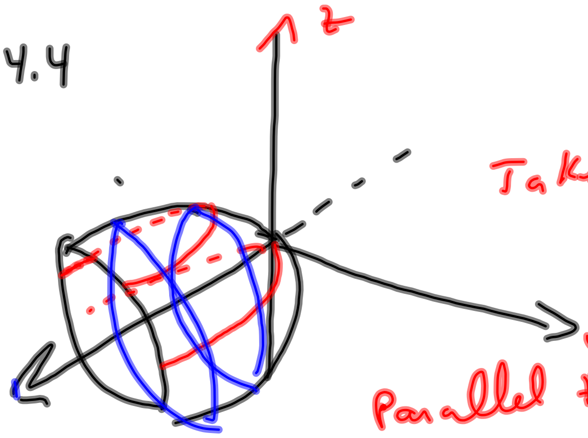
$\bar{r} = \langle x-x_0, y-y_0, z-z_0 \rangle$ is parallel to the plane.

So $\bar{n} \cdot \bar{r} = 0$

$ax + by + cz + d = 0$ meh

$a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$ Yeah.

§14.4



Take more slices. Not just $x=0, y=0,$ or $z=0$

Parallel to yz-plane.

§14.3 #s 43, 44 → Maple/Grapher Hold off, maybe

(49, 53) → Projects? Hold off

$$\int \bar{v}'(t)\,dt = \bar{v}(t) + \bar{C}$$

§14.4 $\bar{r}$ = position vector = $\bar{r}(t)$

$\bar{v}(t)$ = velocity vector = $\bar{r}'(t)$

$\bar{a}(t)$ = acceleration = $\bar{v}'(t) = \bar{r}''(t)$

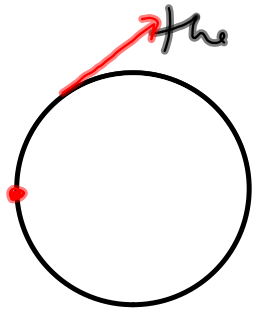
$$|\bar{v}(t)| = |\bar{r}'(t)| = \frac{ds}{dt} = \text{speed.}$$

Rocket Science : $F = ma$

$\bar{F} = m\bar{a}$

$\bar{F}(t) = m(t)\,\bar{a}(t)$

Example 4: Moving around in a circle, the force is always directed inward. The particle wants to move in a straight line.



$g = |\bar{a}| = 9.8\ m/s^2$ from gravity.

$\bar{r} = \langle x, y \rangle$

$\bar{r}(t) = \langle x(t), y(t) \rangle = x(t)\,\bar{i} + y(t)\,\bar{j}$

$\bar{a} = -g\,\bar{j}$

A projectile is shot with an initial velocity $\bar{v}_0 = \langle 50, 50 \rangle$

from a position $\bar{r}_0 = \langle 20, 10 \rangle$

Where is it, when $t = 3$ seconds?

$\bar{a}(t) = \langle 0, -9.8 \rangle$

$\Rightarrow \bar{v}(t) = \int \bar{a}(t)\,dt + \bar{C}$

$\frac{50}{9.8}$

$= \int \langle 0, -9.8 \rangle\,dt + \bar{C}$

$= \langle 0, -9.8t \rangle + \langle c_1, c_2 \rangle$

and we know that when $t = 0$, $\bar{v}(t) = \langle 50, 50 \rangle$

$\bar{v}(0) = \langle 50, 50 \rangle$
$= \bar{v}_0$

That means

$\bar{v}(0) = \langle 0, -9.8(0) \rangle + \langle c_1, c_2 \rangle = \langle 50, 50 \rangle$

$\Rightarrow c_1 = c_2 = 50$ &

$s(t) = -\frac{1}{2}gt^2 + v_0 t + s_0$

$v(t) = \langle 50, -9.8t + 50 \rangle$

$\bar{r}(t) = \int \bar{v}(t)\,dt + \bar{D}$

$= \int \langle 50, -9.8t + 50 \rangle\,dt + \langle d_1, d_2 \rangle$

$= \langle 50t, -\frac{9.8t^2}{2} + 50t \rangle + \langle d_1, d_2 \rangle$

and $\bar{r}(0) = \bar{r}_0 = \langle 20, 10 \rangle = \langle d_1, d_2 \rangle$

So $\bar{r}(t) = \langle 50t, -4.9t^2 + 50t \rangle + \langle 20, 10 \rangle$

$= \langle 50t + 20, -4.9t^2 + 50t + 10 \rangle$

$= (50t + 20)\,\bar{i} + (-4.9t^2 + 50t + 10)\,\bar{j}$

Feb 10-12:37 PM

$v = |\bar{v}| = \text{speed}.$

$\bar{T} = \frac{\bar{r}'}{|\bar{r}'|} = \frac{\bar{v}}{|\bar{v}|} = \frac{\bar{v}}{v} = \frac{1}{v}\bar{v}$

τ

κ $v\bar{T} = \bar{v}$

[5] $\bar{a} = \bar{v}' = (v\bar{T})' = v'\bar{T} + v\bar{T}'$

[6] $\kappa = \frac{|\bar{T}'|}{|\bar{v}|} = \frac{|\bar{T}'|}{|\bar{r}'|} = \frac{|\bar{T}'|}{v} \Rightarrow$

$|\bar{T}'| = \kappa v$

$\bar{T}' = |\bar{T}'|\bar{N} = \kappa v \bar{N}$

$\therefore \bar{a} = v'\bar{T} + \kappa v^2 \bar{N}$