

5. Find the equations of the line tangent to  $\vec{r}(t) = 2t\vec{i} + 3t^2\vec{j} + 4t^3\vec{k}$  at  $t=1$ .

$$\begin{aligned}\vec{r}(1) &= 2\vec{i} + 3\vec{j} + 4\vec{k} \\ \vec{r}'(t) &= 2\vec{i} + 6t\vec{j} + 12t^2\vec{k} \\ \vec{r}'(1) &= 2\vec{i} + 6\vec{j} + 12\vec{k}\end{aligned}$$

The line through  $(2, 3, 4)$  // to  $2\vec{i} + 6\vec{j} + 12\vec{k}$  is

$$\begin{cases} x-2=2t \\ y-3=6t \\ z-4=12t \end{cases}$$

6. Find the intersection of  $\frac{x-3}{1} = \frac{y+1}{-2} = \frac{z-10}{3}$  and  $2x+3y=z$ .

$$x = t+3$$

$$y = -2t-1$$

$$z = 3t+10$$

is the line. The line hits the plane when

$$2(t+3) + 3(-2t-1) = 3t+10$$

$$2t+6-6t-3 = 3t+10$$

$$-7 = 7t$$

$$-1 = t$$

the intersection is

$$(2, 1, 7)$$