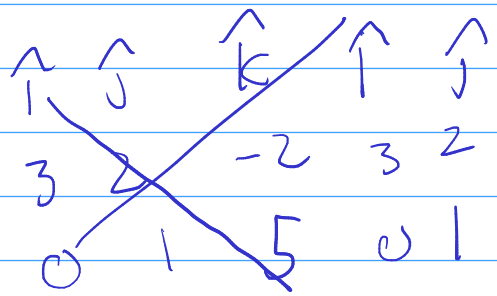
1. Vector

$-2\hat{i}$ $15\hat{j}$

7.



$10\hat{i}$ $3\hat{k}$

$12\hat{i} - 15\hat{j} + 3\hat{k}$

5. Passes through $P = (2, -4, 1)$, parallel to $\vec{d} = \langle 9, 2, 5 \rangle$.

$\langle 2, -4, 1 \rangle + t\langle 9, 2, 5 \rangle$

$\langle 2+9t, 2t-4, 1+5t \rangle$

$$\frac{x-2}{9} = \frac{y+4}{2} = \frac{z-1}{5}$$

7. Passes through $P = (2, 1, 5)$ and $Q = (7, -2, 4)$.

$P - Q$

$\langle -5, 3, 1 \rangle$

Point: (x_0, y_0, z_0) x, y, z

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Normal Vector: $\langle a, b, c \rangle$

$\langle x-x_0, y-y_0, z-z_0 \rangle \cdot \langle a, b, c \rangle = 0$

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

$$p_1 : x - (y-2) + (z-1) = 0$$
$$p_2 : -2(x-2) + (y+1) + (z-3) = 0$$

$x - y + 2 + z - 1 = 0$

$-z \quad -z$

$x - y + 2 - 1 = -z$

$-x + y - 2 + 1 = z$

$-x + y - 1 = z$

$-2x + 4 + y + 1 + z - 3 =$

$-2x + 2 + y = -z$

$2x - y - 2 = z$

$-x + y - 1 = 2x - y - 2$

$2y = 3x - 1$

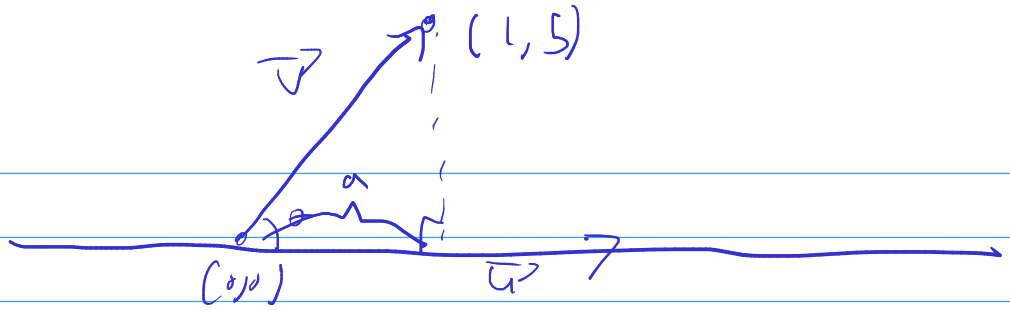
$y = \frac{1}{2}(3x - 1)$

@ $x = 0$: $y = -\frac{1}{2}$: $z = -\frac{3}{2}$

@ $x = 1$: $y = 1$: $z = -1$

$\langle 0, -\frac{1}{2}, -\frac{3}{2} \rangle$

$\langle 1, 1, -1 \rangle$



$\vec{u} \cdot \vec{v} = \|u\| \|v\| \cos\theta$

$\frac{\vec{u} \cdot \vec{v}}{\|\vec{u}\|} = q$ The projection of $\vec{v}$ onto $\vec{u}$

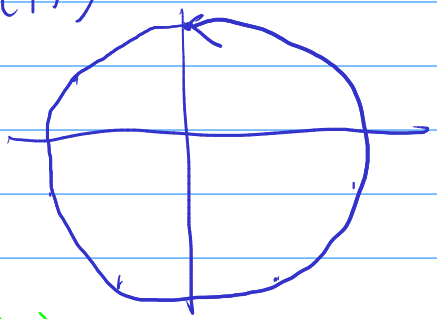
Vector Valued Functions

$$f(x) = \begin{bmatrix} 2x^2 \\ 3\cos(x) \end{bmatrix} \qquad \langle 2x^2, 3\cos(x) \rangle$$

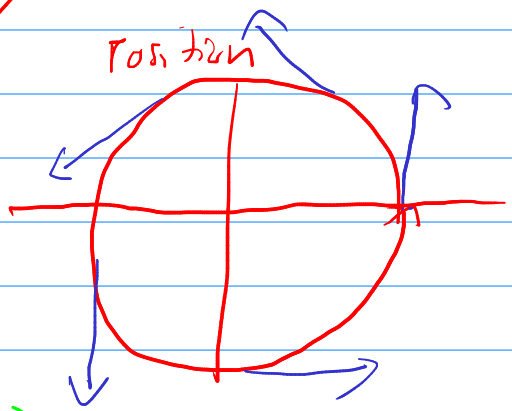
$f(t) = \langle 2t^2, 3\cos(t) \rangle$

- $f(t) = \langle \cos t, \sin t \rangle$
- $f'(t) = \langle -\sin(t), \cos(t) \rangle$

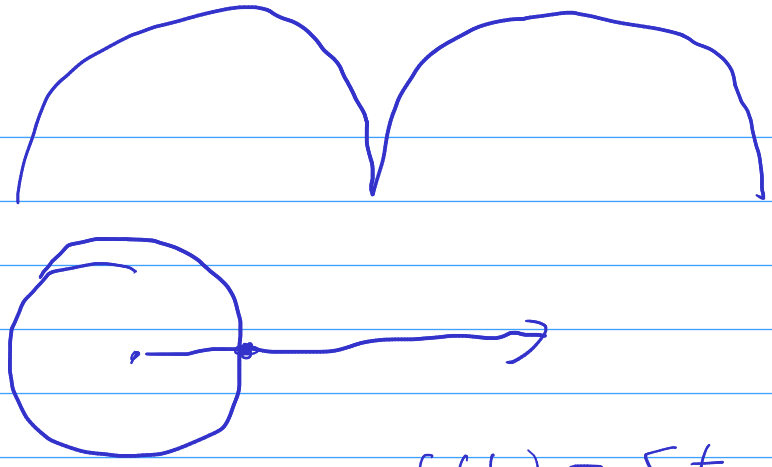
velocity



position



- $f''(t) = \langle -\cos(t), -\sin(t) \rangle$



$$c(t) = \langle t, 1 \rangle$$

$$d(t) = \langle \cos(t), \sin(t) \rangle$$

$$f(t) = \langle t + \cos(t), 1 + \sin(t) \rangle$$

$$\int_0^{2\pi} \langle t + \cos(t), 1 + \sin(t) \rangle \, dt$$

$$\left\langle \frac{1}{2}t^2 + \sin(t) + C_x, t - \cos(t) + C_y \right\rangle \Big|_0^{2\pi}$$

$$\langle 2\pi^2, 2\pi \rangle$$

- $f'(t) = \langle -\sin(t), \cos(t) \rangle$

$t = \pi/4$

$\langle \cos(t), \sin(t) \rangle$

$\left\langle \frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right\rangle$

$\left\langle -\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right\rangle$

$$\left\langle \frac{\sqrt{2}}{2} + \frac{-\sqrt{2}}{2}t, \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}t \right\rangle$$