

Quiz #3

1)
 $\vec{a}(t) = 3t \vec{i} + e^{-t} \vec{j} + \sin t \vec{k} \Rightarrow$

$$\vec{v}(t) = \int \vec{a}(t) dt = \frac{3}{2} t^2 \vec{i} - e^{-t} \vec{j} - \cos t \vec{k} + \vec{v}_0$$

Substitute for $\vec{v}(0) = \vec{0} \Rightarrow$

$$\vec{v}(0) = -\vec{j} - \vec{k} + \vec{v}_0 = \vec{0} \Rightarrow \boxed{\vec{v}_0 = \vec{j} + \vec{k}}$$

$$\Rightarrow \boxed{\vec{v}(t) = \frac{3}{2} t^2 \vec{i} + (1 - e^{-t}) \vec{j} + (1 - \cos t) \vec{k}}$$

$$\vec{r}(t) = \int \vec{v}(t) dt = \frac{1}{2} t^3 \vec{i} + (t + e^{-t}) \vec{j} + (t - \sin t) \vec{k} + \vec{r}_0$$

Substitute for $\vec{r}(0) = \vec{i}$

$$\vec{r}(0) = \vec{j} + \vec{r}_0 = \vec{i} \Rightarrow \boxed{\vec{r}_0 = \vec{i} - \vec{j}} \Rightarrow$$

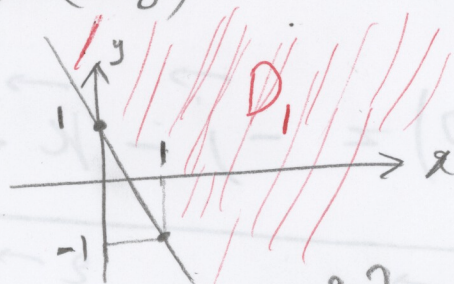
$$\boxed{\vec{r}(t) = \left(\frac{1}{2} t^3 + 1\right) \vec{i} + (t + e^{-t} - 1) \vec{j} + (t - \sin t) \vec{k}}$$

$$\text{Speed } |\vec{v}(t)| = \sqrt{\left(\frac{3}{2} t^2\right)^2 + (1 - e^{-t})^2 + (1 - \cos t)^2}$$

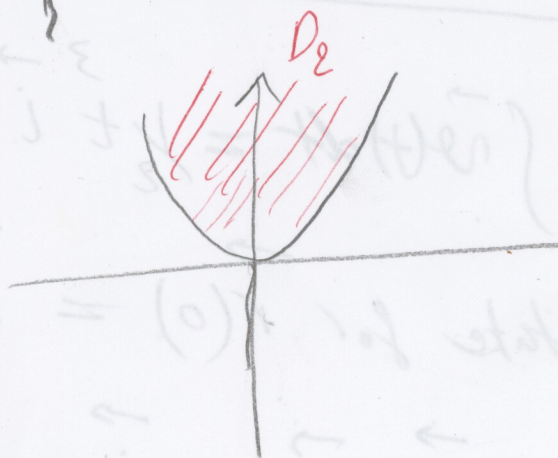
$$2) \quad f(x, y) = \sqrt{2x+y-1} + \ln(y-x^2)$$

$$D_1 = \{(x, y) \mid 2x+y-1 \geq 0\} = \{(x, y) \mid y \geq 1-2x\}$$

$y \geq 1-2x$ describes the points (x, y) lie on or above line $y = 1-2x$



$$D_2 = \{(x, y) \mid y-x^2 > 0\} = \{(x, y) \mid y > x^2\}$$



Domain of $f(x, y) = D_1 \cap D_2$

