

$$5. \vec{r}(t) = t^3 \vec{i} + t^2 \vec{j} + 5t \vec{k}$$

$$\vec{v}(t) = 3t^2 \vec{i} + 2t \vec{j} + 5 \vec{k}$$

$$\vec{a}(t) = 6t \vec{i} + 2 \vec{j}$$

$$\text{SPEED} = \|\vec{v}'(t)\| = \|\vec{v}(t)\| = \sqrt{(3t^2)^2 + (2t)^2 + (5)^2}$$

$$= \sqrt{9t^4 + 4t^2 + 25}$$

$$6. \vec{r}(t) = \langle \cos t, \sin t, 5t \rangle$$

$$\vec{v}(t) = \langle -\sin t, \cos t, 5 \rangle$$

$$\vec{a}(t) = \langle -\cos t, -\sin t, 0 \rangle$$

$$\text{SPEED} = \|\vec{v}(t)\| = \sqrt{(-\sin t)^2 + (\cos t)^2 + 5^2}$$

$$= \sqrt{\sin^2 t + \cos^2 t + 25}$$

$$= \sqrt{1 + 25}$$

$$= \sqrt{26}$$

$$7. \vec{a}(t) = 3\vec{i} + 2\vec{j} - 5\vec{k}, \quad \vec{v}(0) = \vec{0}, \quad \vec{r}(0) = \vec{0}$$

$$\vec{v}(t) = \int (3\vec{i} + 2\vec{j} - 5\vec{k}) dt$$

$$\vec{v}(t) = 3t\vec{i} + 2t\vec{j} - 5t\vec{k} + \vec{C}$$

PLUG IN $t=0$

$$\vec{v}(0) = 3(0)\vec{i} + 2(0)\vec{j} - 5(0)\vec{k} + \vec{C}$$

$$\vec{0} = \vec{C}$$

$$\vec{v}(t) = 3t\vec{i} + 2t\vec{j} - 5t\vec{k}$$

$$\vec{r}(t) = \int (3t\vec{i} + 2t\vec{j} - 5t\vec{k}) dt$$

$$\vec{r}(t) = \frac{3}{2}t^2 \vec{i} + t^2 \vec{j} - \frac{5}{2}t^2 \vec{k} + \vec{C}$$

PLUG IN $t=0$

$$\vec{r}(0) = \frac{3}{2}(0)^2 \vec{i} + (0)^2 \vec{j} - \frac{5}{2}(0)^2 \vec{k} + \vec{C}$$

$$\vec{0} = \vec{C}$$

SO

$$\vec{r}(t) = \frac{3}{2}t^2 \vec{i} + t^2 \vec{j} - \frac{5}{2}t^2 \vec{k}$$

AT $t=2$

$$\vec{r}(2) = \frac{3}{2}(2)^2 \vec{i} + (2)^2 \vec{j} - \frac{5}{2}(2)^2 \vec{k}$$

$$= 6\vec{i} + 4\vec{j} - 10\vec{k}$$