

2. (a)  $\frac{\sqrt{6}}{2}$  (b)  $x + y + 2z = 3$  (c)  $(0, 1, 1)$

1. (a)  $\vec{QP} = \hat{i} - 2\hat{j}$  (b)  $\frac{4}{\sqrt{65}}$  (c)  $\frac{9}{\sqrt{130}}$   
 $\vec{QR} = -2\hat{j} + 3\hat{k}$

1. (a)  $\frac{7}{2}$  (b)  $6x + 3y + 2z = 11$  (c) YES

1.  $\vec{r}(\alpha) = \langle -1, 1, 1 + \alpha \rangle$

1.  $\pi/4$

1.  $\vec{v}(t) = -3\sin t \hat{i} + 3\cos t \hat{j} + \hat{k} = \langle -3\sin t, 3\cos t, 1 \rangle$   
 $\vec{a}(t) = -3\cos t \hat{i} - 3\sin t \hat{j} = \langle -3\cos t, -3\sin t, 0 \rangle$   
 speed =  $|\vec{v}(t)| = \sqrt{10}$

3. (a)  $\langle 4, -3, -2 \rangle$  (b)  $\langle 4, -3, -2 \rangle \cdot \vec{r}(t) = 6$   
 (c)  $\frac{d}{dt} (\langle 4, -3, -2 \rangle \cdot \vec{r}(t)) = 0 \Rightarrow \langle 4, -3, -2 \rangle \cdot \vec{v}(t) + 0 = 0$   
 $\Rightarrow \vec{N} \perp \vec{v}(t)$

1.  $\langle t, \cos t, t \sin t \rangle$

0. line:  $\langle 0, 3, \frac{20}{20} \rangle$ , acceleration:  $\langle +2, -3, 0 \rangle$

1.  $t^3 + 2t$