Test-1-version A

No work = No credit!

1. Given $\overrightarrow{a} = \langle 0, -1, 1\rangle$ and $\overrightarrow{b} = \langle 1, 0, 1\rangle$. Find (i) the angle between $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$; (ii) the area of parallelogram determined by $\overrightarrow{a}$ and $\overrightarrow{b}$. (7+8=15 pt)

2. Given $O(0, 0, 0)$, $P(0, 1, 1)$, $Q(1, 0, 1)$, $R(1, 1, 0)$, and plane S_1 contains O, P and Q. Find (i) equation of plane S_1 (ii) equation of plane S_2 which is parallel to S_1 and contains R; (iii) $d(S_1, S_2)$. (8+8+4=20 pt)

3. Given $A(2, 2, 1)$, $P(0, 1, 1)$, $Q(1, 0, 1)$, $R(1, 1, 0)$, line ℓ_1 contains P and Q, and ℓ_2 contains A and R. Find (i) equations of ℓ_1 and ℓ_2; (ii) $d(\ell_1, \ell_2)$ (12+8=20 pt)

4. Reparametrize the curve $\overrightarrow{r}(t) = \langle \sin(t) - t\cos(t), \cos(t) + t\sin(t)\rangle$ with respect to arc length measured from the point $\overrightarrow{r}(0) = \langle 0, 1\rangle$ in the direction of increasing t. (20 pt)

5. For curve $\overrightarrow{r}(t) = \langle t, t, t^2\rangle$, find $\widehat{T}$, $\widehat{N}$, $\widehat{B}$, curvature κ and torsion τ. (4+4+4+4+4=20 pt)

6. A particle starts at $\overrightarrow{r}(0) = \langle 1, 2, 3\rangle$ with initial velocity $\overrightarrow{v}(0) = \langle 4, 5, 6\rangle$. Its acceleration is $\overrightarrow{a}(t) = \langle \sin(t), \cos(t), e^t\rangle$. Find its position function $\overrightarrow{r}(t)$. (15 pt)

Test-1-version B

No work = No credit!

1. Given $\overrightarrow{a} = \langle -1, 0, 1\rangle$ and $\overrightarrow{b} = \langle 0, 1, 1\rangle$. Find (i) the angle between $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$; (ii) the area of parallelogram determined by $\overrightarrow{a}$ and $\overrightarrow{b}$. (7+8=15 pt)
2. Given $O(0,0,0)$, $P(0,1,1)$, $Q(1,0,1)$, $R(1,1,0)$, and plane S_1 contains O, P and R. Find (i) equation of plane S_1 (ii) equation of plane S_2 which is parallel to S_1 and contains Q; (iii) $d(S_1, S_2)$. (8+8+4=20 pt)
3. Given $A(0,0,-1)$, $P(0,1,1)$, $Q(1,0,1)$, $R(1,1,0)$, line ℓ_1 contains P and Q, and ℓ_2 contains A and R. Find (i) equations of ℓ_1 and ℓ_2; (ii) $d(\ell_1, \ell_2)$ (12+8=20 pt)
4. Reparametrize the curve $\overrightarrow{r}(t) = \langle \sin(t) - t\cos(t), \cos(t) + t\sin(t)\rangle$ with respect to arc length measured from the point $\overrightarrow{r}(0) = \langle 0, 1\rangle$ in the direction of increasing t. (20 pt)
5. For curve $\overrightarrow{r}(t) = \langle t, t, t^2\rangle$, find $\widehat{T}$, $\widehat{N}$, $\widehat{B}$, curvature κ and torsion τ. (4+4+4+4+4=20 pt)
6. A particle starts at $\overrightarrow{r}(0) = \langle 4, 5, 6\rangle$ with initial velocity $\overrightarrow{v}(0) = \langle 1, 2, 3\rangle$. Its acceleration is $\overrightarrow{a}(t) = \langle \sin(t), \cos(t), e^t\rangle$. Find its position function $\overrightarrow{r}(t)$. (15 pt)