Questions for Module # 8

Q.1 The vector $\vec{v} = \langle 6, -4, 0 \rangle$ starts at the point $P = (-2, 5, -1)$. At what point does the vector end? Solution

Q.2 Determine the angle between $\vec{v} = \langle 1, 2, 3, 4 \rangle$ and $\vec{w} = \langle 0, -1, 4, -2 \rangle$. Solution

Q.3 Find a vector that is orthogonal to the plane containing the points $P = (3, 0, 1)$, $Q = (4, -2, 1)$ and $R = (5, 3, -1)$. Solution

Q.4 Which of the points $P = (-1, 4, -7)$ and $Q = (6, -1, 5)$ is closest to the z-axis? Solution

Q.5 Give the equation of the line through the points $(2, -4, 1)$ and $(0, 4, -10)$ in vector form, parametric form and symmetric form. Solution

Q.6 Determine the intersection point of the line through the points $(1, -2, 13)$ and $(2, 0, -5)$ and the line given by $\vec{r}(t) = \langle 2 + 4t, -1 - t, 3 \rangle$ or show that they do not intersect. Solution

Q.7 Does the line given by $x = 9 + 21t$, $y = -7$, $z = 12 - 11t$ intersect the xy-plane? If so, give the point. Solution

Q.8 Write down the equation of the plane containing the point $(-8, 3, 7)$ and parallel to the plane given by $4x + 8y - 2z = 45$. Solution

Q.9 Determine if the plane given by $4x - 9y - z = 2$ and the plane given by $x + 2y - 14z = -6$ are parallel, orthogonal or neither. Solution

Q.10 Determine if the line given by $\vec{r}(t) = \langle -2t, 2 + 7t, -1 - 4t \rangle$ intersects the plane given by $4x + 9y - 2z = -8$ or show that they do not intersect. Solution

Q.11 Find the domain for the vector function : $\vec{r}(t) = \langle \ln(4 - t^2), \sqrt{t+1} \rangle$ Solution

Q.12 Sketch the graph of the vector function : $\vec{r}(t) = \langle 4\sin(t), 8\cos(t) \rangle$ Solution

Q.13 Evaluate $\int_{-1}^{2} \vec{r}(t)\, dt$ where $\vec{r}(t) = \langle 6, 6t^2 - 4t, te^{2t} \rangle$ Solution

Q.14 Find the tangent line to $\vec{r}(t) = \cos(4t)\,\vec{i} + 3\sin(4t)\,\vec{j} + t^3\vec{k}$ at $t = \pi$. Solution

Q.15 Determine the length of $\vec{r}(t) = \langle \frac{1}{3}t^3, 4t, \sqrt{2}t^2 \rangle$ from $0 \le t \le 2$. Solution

Q.16 Determine the tangential and normal components of acceleration for the object whose position is given by $\vec{r}(t) = \langle \cos(2t), -\sin(2t), 4t \rangle$. Solution

Q.17 An objects acceleration is given by $\vec{a} = 3t\,\vec{i} - 4e^{-t}\,\vec{j} + 12t^2\vec{k}$. The objects initial velocity is $\vec{v}(0) = \vec{j} - 3\vec{k}$ and the objects initial position is $\vec{r}(0) = -5\vec{i} + 2\vec{j} - 3\vec{k}$. Determine the objects velocity and position functions. Solution