Worksheet 4, Math 53
Vector Geometry and Vector Functions

Monday, September 17, 2012

1. Find an equation of the plane:
   (a) The plane through the point $(2, 4, 6)$ and parallel to the plane $z = x + y$.
   (b) The plane through the points $(0, 1, 1)$, $(1, 0, 1)$, and $(1, 1, 0)$.
   (c) The plane that passes through the point $(1, -1, 1)$ and contains the line with symmetric equations $x = 2y = 3z$.
2. Where does the line through $(1, 0, 1)$ and $(4, -2, 2)$ intersect the plane $x + y + z = 6$?
3. Find a vector equation and parametric equations for the line segment that joins $P(a, b, c)$ to $Q(u, v, w)$.
4. Suppose that a particle's position vector is given by $\mathbf{r}(t) = t\mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}$. Find its position, velocity, speed, and acceleration when $t = 10$. Find the tangent line to this curve at the point $(2, 4, 8)$.
5. Let $\mathbf{r}(t) = (\cos t)\mathbf{i} + (\sin t)\mathbf{j} + 0\mathbf{k}$.
   (a) Is $\mathbf{r}(t)$ perpendicular to $\mathbf{r}'(t)$ for every t?
   (b) Is $\mathbf{r}'(t)$ perpendicular to $\mathbf{r}''(t)$ for every t?
   (c) If $\mathbf{r}$ were another function, would the two answers above remain the same? If so, show why. If not, give a counterexample.