Name: Date: 09/08/2016

M20550 Calculus III Tutorial
Worksheet 2

1. Find an equation of the plane passes through the point $(1, 1, -7)$ and perpendicular to the line $x = 1 + 4t$, $y = 1 - t$, $z = -3$.

2. Let ℓ be the line of intersection of the planes given by equations $x - y = 1$ and $x - z = 1$. Find an equation for ℓ in the form $\mathbf{r}(t) = \mathbf{r}_0 + t\mathbf{v}$.

3. A particle moves in space in such a way that at time t ($t \geq 0$), its position is given by the vector-valued function $\mathbf{r}(t) = \langle t^2 + 1, 2t^2 - 1, 2 - 3t^2 \rangle$.

   (a) At what time(s) does the particle hit the plane $2x + 2y + 3z = 3$?

   (b) Find the point of intersection, if any.

4. Find an equation of the tangent line to the space curve $\mathbf{r}(t) = \langle 2t^3, 3t, 3t^2 \rangle$ at the point $(-2, -3, 3)$.

5. Find $\mathbf{r}(t)$ if $\mathbf{r}''(t) = e^t\mathbf{i}$, $\mathbf{r}(0) = 2\mathbf{i} + 3\mathbf{j} + 2\mathbf{k}$, and $\mathbf{r}'(0) = \mathbf{i} + \mathbf{j} + \mathbf{k}$.

6. Let P be a plane with normal vector $\langle -2, 2, 1 \rangle$ passing through the point $(1, 1, 1)$. Find the distance from the point $(1, 2, -5)$ to the plane P.

7. Find an equation of the plane that passes through the point $(1, 2, 3)$ and contains the line $\dfrac{1}{3}x = y - 1 = 2 - z$.

8. Find a vector function that represents the curve of intersection of the cylinder $x^2 + y^2 = 9$ and the plane $x + y - z = 5$.