MATH 2415	Calculus III SI Session	09/21/11
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Wednesdays Rm 1245		03:00 PM - 05:00 PM and 05:00 PM - 07:00 PM

1. Find an equation of the plane containing the points (2,1,1),(-31,-2), and (4,-5,-5).

2. The planes $2x + 3y - z = 2$ and $x - y + 3z = -1$ intersect in a line. Verify these planes intersect. Find parametric equations for this line.

3. Find an equation of the plane containing the point (-1,1,4) and orthogonal to the line given by $x = 1+2t$, $y = 3 - t$, $z = 8 + 3t$.

4. Find an equation of the plane which contains the points (1,1,-3) and (2,-1,-2) and is perpendicular to the plane given by $2x - 3y - z = 6$.

5. Find the distance between the point (1,2,3) and the line with parametric equations $x = 1 + t, y = 1 - t, z = 2t$.

6. Represent the plane curve by a vector-valued function. (There are many correct answers.)
   (a) $2x - 3y + 5$
   (b) $y = 4 - x^2$
   (c) $(x - 2)^2 + y^2 = 4$
   (d) $\frac{x^2}{16} - \frac{y^2}{9} = 1$

7. Evaluate the limit.
   (a) $\lim_{t\to+\infty} \left\langle \frac{t^2+1}{3t^2+2}, \frac{1}{t} \right\rangle$ (b) $\lim_{t\to0}(\mathrm{e}^t\,\hat{\imath} + \frac{\sin t}{t}\hat{\jmath} + \mathrm{e}^{-t}\,\hat{k})$ (c) $\lim_{t\to1}(\sqrt{t}\hat{\imath} + \frac{\ln t}{t^2-1}\hat{\jmath} + 2t^2\hat{k})$
   (d) $\lim_{t\to+\infty}(\mathrm{e}^{-t}\,\hat{\imath} + \frac{1}{t}\hat{\jmath} + \frac{t}{t^2+1}\hat{k})$

8. A particle travels along the curve given by $\mathbf{r}(t) = (2\cos t, 2\sin t, t)$ where $0 \le t \le \pi$.
   (a) Find the length of the curve traced by the particle.
   (b) Find parametric equations for the line tangent to the curve at the point $(-2, 0, \pi)$.
   (c) At what time will the particle be exactly 7 units from the origin?
   (d) Show that the velocity and acceleration of the particle are always orthogonal.
   (e) At what time will the particle intersect the surface $z + 1 = x^2 + y^2$?