Math 117
Spring 2001

Second Midterm

Temple University
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1. (a) (2 points) Complete the squares and find the center and radius of the sphere of equation:

$$x^2 + y^2 + z^2 - 12x + 14y - 8z + 1 = 0.$$

   (b) (2 points) Find the equation of the sphere that has the line segment joining $(-2, 3, 6)$ and $(4, -1, 5)$ as diameter.

2. (a) (2 points) Find the length and direction cosines for the vector: $-2\boldsymbol{i} - 3\boldsymbol{j} + 7\boldsymbol{k}$.

   (b) (2 points) Find a unit vector with the same direction as $3\boldsymbol{i} - 4\boldsymbol{j} + 5\boldsymbol{k}$ and a vector of length 10 oriented in the opposite direction.

3. (a) (2 points) Find two vectors of length 10 each of which is perpendicular to both $-4\boldsymbol{i} + 5\boldsymbol{j} + \boldsymbol{k}$ and $4\boldsymbol{i} + \boldsymbol{j} + 2\boldsymbol{k}$.

   (b) (2 points) Find the equation of the plane passing through the point $P(-2, -3, 4)$ and perpendicular to $\boldsymbol{n} = 3\boldsymbol{i} - 2\boldsymbol{j} - \boldsymbol{k}$.

4. (a) (2 points) Find the symmetric equations of the line through the point $P(4, 0, 6)$ and perpendicular to the plane $x - 5y + 2z - 10 = 0$.

   (b) (2 points) Find the parametric equations of the line through $(5, -3, 4)$ that intersects the z-axis at right angles.

5. (a) (2 points) Find the velocity $\boldsymbol{v}$, acceleration $\boldsymbol{a}$ and speed s of the curve

$$\boldsymbol{r}(t) = (1/t)\boldsymbol{i} + (t^2 - 1)^{-1}\boldsymbol{j} + t^5\boldsymbol{k}$$

   at time $t_1 = 2$.

   (b) (2 points) Find the length of the curve with vector equation

$$\boldsymbol{r}(t) = \sqrt{6}t^2\boldsymbol{i} + \frac{2}{3}t^3\boldsymbol{j} + 6t\boldsymbol{k}$$

   for $3 \leq t \leq 6$.