MA18 Midterm 1 (1-Mar-06) **Name:** _____

Write neatly. Show all your work. I am unable to read your mind, and will not attempt to read between the lines.

1. A=(5,8,10), B=(3,4,7), and C=(4,5,6) are three points in space.
   a) One angle of triangle ABC is a right angle. Which angle is it?
   b) A right triangle must satisfy the Pythagorean Theorem. Show that triangle ABC does.

2. Let $v_1 = \langle 1, 0, 1 \rangle$ and $v_2 = \langle 2, 2, 1 \rangle$. Find the area of the parallelogram spanned by v_1 and v_2.

3. Describe and/or sketch the following surfaces:
   a) In cylindrical coordinates, $r^2 = r$.
   b) In spherical coordinates, $\rho \cos \phi = 3$.

4. Find each limit or show that it does not exist.
   a) $\lim_{(x,y)\to(\pi,\pi)} x \sin\left(\frac{x+y}{4}\right)$

   b) $\lim_{(x,y)\to(0,0)} \frac{x^2}{x^2+y^2}$.

5. Find the equation of a plane that passes through the point $(1, 1, 1)$ and is perpendicular to the vector $\langle 1, -1, 2\rangle$. (Write the equation in the form $Ax + By + Cz = D$.) What are the $x-$, $y-$, and $z-$intercepts of the plane?

6. Find the arc length of the curve

$$\mathbf{r}(t) = \left\langle \frac{3}{2}t^2, \frac{4}{3}t^3 \right\rangle$$

between the points $(0, 0)$ and $(3/2, 4/3)$.