Instructions: Write complete legible solutions to the following problems in the space provided. Be sure to supply all the necessary steps that lead to your answers.

1. Find a parametric representation to the given surfaces

a. The equation of the plane that passes through $p(1,1,-1)$ and contains the vectors
$$\mathbf{u} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}, \text{ and } \mathbf{v} = \mathbf{i} - \mathbf{j} + 2\mathbf{k}$$

b. $z = \sqrt{x^2 + 4y^2}$

c. The part of the sphere $x^2 + y^2 + z^2 = 1$ that lies below $z = \sqrt{x^2 + y^2}$

d. The part of the plane $z = x + 3$ that lies inside the cylinder $x^2 + y^2 = 1$

2. Find an equation of the tangent plane to the given parametric surface at the specified point.

$$x = u^2 + 1, \; y = v^3 + 1, \; z = u + v, \; p(5, 2, 3)$$

3. Find the surface area of the part of the paraboloid $y = x^2 + z^2$ that lies inside the cylinder

$$x^2 + z^2 = 9$$

.

4 Find the surface area of the part of the sphere $4 = x^2 + y^2 + (z - 2)^2$ that lies inside the cylinder

$$x^2 + y^2 = 1$$

.