Math 234: Review 3

Please, do these problems.
Chapter VI.3 numbers 1d, 4, 5dh, 8, 10
Chapter VI.7 numbers 1b, 2, 4, 7b, 12, 16, 18, 22
Chapter VII.4 numbers 1, 4
Chapter VII.8 number 3
Chapter VII.12 numbers 2, 5cgik
Chapter VII.17 numbers 3, 5, 7, 9, 11

and

1. Find the parametrization of the surface. There are many correct ways of doing this.
   (a) Tilted plane inside cylinder: The portion of the plane \( x + y + z = 1 \) inside the cylinder
       (i) \( y^2 + z^2 = 9 \)
   (b) Circular cylinder band: The portion of the plane \( (x - 2)^2 + z^2 = 4 \) between the planes
       \( y = 0 \) and \( y = 3 \).

2. Use a parametrization to express the area of the surface as a double integral. Then evaluate the integral. Again, there is more than one correct way.
   (a) Sawed off sphere: The lower portion cut from the sphere \( x^2 + y^2 + z^2 = 2 \), by the cone \( z = \sqrt{x^2 + y^2} \).
   (b) Parabolic band: The portion of the paraboloid \( y = x^2 + z^2 \) between \( y = 2 \) and \( y = 5 \).

3. Integrate \( G(x, y, z) = x\sqrt{y^2 + 4} \) over the surface cut from the parabolic cylinder \( y^2 + 4z = 16 \) by the planes \( x = 0 \), \( x = 1 \) and \( z = 0 \).

4. Finding the flux across a surface. Use a parametrization to find the flux \( \iint_S \vec{F} \cdot \vec{n} dA \) across the surface in the given direction.
   (a) Sphere: \( \vec{F} = zx\vec{i} + zy\vec{j} + z^2\vec{k} \) across the portion of the sphere \( x^2 + y^2 + z^2 = a^2 \) in the first octant in the direction away from the origin.
   (b) Paraboloid: \( \vec{F} = 4x\vec{i} + 4y\vec{j} + 2\vec{k} \) outward (normal away from the z-axis) through the portion of the surface cut from the bottom of the paraboloid \( z = x^2 + y^2 \) by the plane \( z = 1 \).