Question 1 (5 pts). Find the volume of the parallelepiped determined by the vectors \((3, 2, 6), (1, 1, 3)\) and \((3, 1, 1)\) (Units are in centimetres).

Solution: The volume of the parallelepiped determined by the vectors \(\vec{a}, \vec{b}\) and \(\vec{c}\) is given by the formula

\[
\text{Volume} = \left| \vec{a} \cdot (\vec{b} \times \vec{c}) \right|.
\]

Here we choose, for example, \(\vec{a} = (3, 2, 6), \vec{b} = (1, 1, 3)\) and \(\vec{c} = (3, 1, 1)\). Then we compute

\[
(1, 1, 3) \times (3, 1, 1) = (-2, 8, -2),
\]

so the volume is

\[
\text{Volume} = |(3, 2, 6) \cdot (-2, 8, -2)| = |-2| = 2[\text{cm}^2].
\]

Question 2 (5 pts). Describe in words the level sets of the function

\[
v(x, y) = \sqrt{25 - x^2 - y^2}.
\]

To get full credit you must justify your answer.

Solution: The level sets of a function \(v(x, y)\) are defined through the equation

\[
v(x, y) = \alpha,
\]

for some constant \(\alpha\). Here this equation is

\[
v(x, y) = \sqrt{25 - x^2 - y^2} = \alpha
\]

which, after some algebra, becomes

\[
x^2 + y^2 = 25 - \alpha^2.
\]

This is the equation of a circle. Note that, for \(v(x, y)\) to make sense, we must have \(25 - x^2 - y^2 \geq 0\). This means that \(\alpha\) can only take values between 0 and 5, so the level sets are circles of radii between 0 and 5.