First midterm exam

1 Exercise 1 (20 points)

Find the equation of the plane that passes through the point $(1,0,-2)$ and is parallel to the plane of equation $2x - y + 3z = 1$. 
2 Exercise 2-(30 points)

Two ropes of same length 3m are fastened to a holiday decoration that is suspended over a town square. The decoration has a mass of 1kg. The ropes make angles of 45° (or $\frac{\pi}{4}$ radiant) with the horizontal. Find the magnitude of each tension (force applied on the decoration by the ropes) as a function of the gravity constant $g$ and the angles.

Using $\cos\left(\frac{\pi}{4}\right) = \sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$ and $\frac{\sqrt{2}}{\sqrt{2}} = g\frac{\sqrt{2}}{2} \approx 6.93N$, give a numerical value for the magnitude.
3 Exercise 3-(25 points)

The parametric equations of a helix are:

\[ x = t \cos(t), \quad y = \sin(t), \quad z = t. \]

Find the parametric equation of the tangent line of this curve at the point \((2\pi, 0, 2\pi)\) (that is: at \(t = 2\pi\)).

Hint: \(\cos(2\pi) = 1\) and \(\sin(2\pi) = 0\).
4 Exercise 4-(25 points)

Does the limits of the following functions exist at (0, 0) ?

\[ f(x, y) = \frac{2x^2}{x^2 + y^2} \]

\[ g(x, y) = -\frac{3x + y}{x^2 + y^2} \]