Projectiles

A particle is thrown from 3m above horizontal ground, at an angle of 30° above the horizontal, and with an initial speed of 4ms^{-1}

1. Resolve the initial velocity into horizontal and vertical components.
2. Find the maximum height reached, and the time taken to reach it.
3. Let x denote the horizontal position of the particle, relative to its starting point, and y the particle's height above ground level. Find expressions for x and y as functions of time t, and eliminate t to show that
$$y = 3 + \frac{x}{\sqrt{3}} - \frac{g}{4\sqrt{3}}x^2.$$
4. Find the x-coordinate of the point where the particle lands.
5. Find the time taken for the particle to land.