Questão 1

$$\bar{V} = \frac{\Delta S}{\Delta T} = \frac{X_2 - X_1}{\Delta T} = \frac{(X_3 + D/2) - (X_3 - D/2)}{\Delta T} = \frac{D}{\Delta T}$$

Questão 2

$$u(\bar{V}_{(D,\Delta T)}) = \sqrt{\left(\frac{\partial \bar{V}_{(D,\Delta T)}}{\partial D} u(D)\right)^2 + \left(\frac{\partial \bar{V}_{(D,\Delta T)}}{\partial \Delta T} u(\Delta T)\right)^2} =$$

$$= \sqrt{\left(\frac{u(D)}{\Delta T}\right)^2 + \left(\frac{-D\, u(\Delta T)}{(\Delta T)^2}\right)^2} = \sqrt{\frac{u(D)^2}{(\Delta T)^2} + \frac{D^2\, u(\Delta T)^2}{(\Delta T)^4}}$$

Questão 3

$$V = \sqrt{2\, \Delta S\, g\, \sin(\theta)} = \sqrt{2\, (X_3 - X_0)\, g\, \sin(\theta)}$$

Questão 4

$$
\begin{aligned}
&u(V_{(X_3,X_0,\theta)}) = \\
&= \sqrt{\left(\frac{\partial V_{(X_3,X_0,\theta)}}{\partial X_3} u(X_3)\right)^2 + \left(\frac{\partial V_{(X_3,X_0,\theta)}}{\partial X_0} u(X_0)\right)^2 + \left(\frac{\partial V_{(X_3,X_0,\theta)}}{\partial \theta} u(\theta)\right)^2} = \\
&= \sqrt{\begin{array}{l}\left(\frac{\sqrt{2\,g\,\sin(\theta)}}{2\sqrt{X_3}} u(X_3)\right)^2 + \left(\frac{\sqrt{-2\,g\,\sin(\theta)}}{2\sqrt{X_0}} u(X_0)\right)^2 + \\ + \left(\frac{\sqrt{2\,(X_3-X_0)\,g}\,\cos(\theta)}{2\sqrt{\sin(\theta)}} u(\theta)\right)^2\end{array}} = \\
&= \sqrt{\frac{2\,g\,\sin(\theta)\,u(X_3)^2}{4\,X_3} + \frac{-2\,g\,\sin(\theta)\,u(X_0)^2}{4\,X_0} + \frac{2\,(X_3-X_0)\,g\,\cos^2(\theta)\,u(\theta)^2}{4\,\sin(\theta)}} = \\
&= \sqrt{g\,\sin(\theta)\,2^{-1}\left(\frac{u(X_3)^2}{X_3} - \frac{u(X_0)^2}{X_0} + \frac{(X_3-X_0)\,\cos^2(\theta)\,u(\theta)^2}{\sin^2(\theta)}\right)}
\end{aligned}
$$

Questão 5

$$
\begin{aligned}
&v = \sqrt{2\,(X_3-X_0)\,g\,\sin(\theta)}\pm \\
&\pm \sqrt{g\,\sin(\theta)\,2^{-1}\left(\frac{u(X_3)^2}{X_3} - \frac{u(X_0)^2}{X_0} + \frac{(X_3-X_0)\,\cos^2(\theta)\,u(\theta)^2}{\sin^2(\theta)}\right)} = \\
&= \sqrt{2\,(120-30)\,9.81\,\sin(2^\circ)}\pm \\
&\pm \sqrt{9.81\,\sin(2^\circ)\,2^{-1}\left(\frac{1^2}{120} - \frac{1^2}{30} + \frac{(120-30)\,\cos^2(2^\circ)\,u(2^\circ)^2}{\sin^2(2^\circ)}\right)}
\end{aligned}
$$