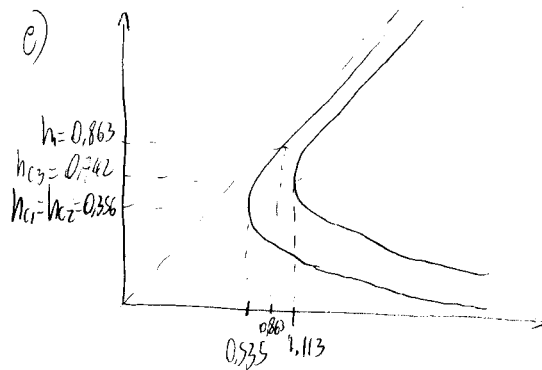


c) El caso límite es que $E_1 = E_c$

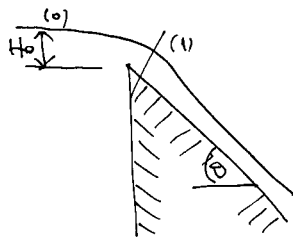
$$E_1 = 0,863 = \frac{3}{2} \left(\frac{q^2}{g} \right)^{1/3} \Rightarrow q = \sqrt[3]{\frac{2 \cdot 0,863^3}{3}} = 1,366 = \frac{Q}{b_1} \Rightarrow b_1 = 1,46 [m] \quad (1,5)$$

d) En las secciones (2) y (3) se mantiene lo mismo, ya que el cambio de ancho sólo afecta hacia aguas arriba, ya que tenemos un río.

$$q_1 = \frac{Q}{b} = \frac{2}{3} ; E = 0,863 = h_1 + \frac{q_1^2}{2gh_1^3} \Rightarrow h_1 = 0,830 [m], \quad (1,0)$$



(0,5)



$$a) E = h \cos \theta + \frac{q^2}{2gh^2}$$

$$b) E_{min} : \frac{dE}{dh} = 0 \Rightarrow \cos \theta - \frac{q^2}{2g} \frac{2}{h^3} = 0$$

$$\frac{q^2}{gh^3} = \cos \theta$$

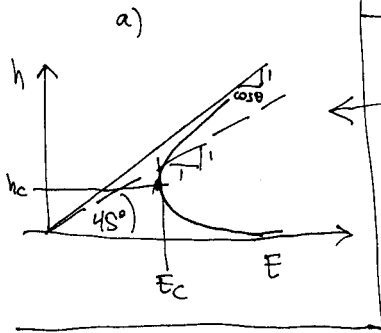
$$h_c = \left\{ \frac{q^2}{g \cos \theta} \right\}^{1/3}$$

$$E_c = h_c \cos \theta + \frac{q^2}{2gh_c^2} = \left(h_c + \frac{h_c}{2} \right) \cos \theta$$

$$\Rightarrow E_c = \frac{3h_c \cos \theta}{2}$$

1.5 pts

1.5 pts. { 1.0 gráfico
0.5 ec.



asintotas : $h \rightarrow \infty \quad E \rightarrow h \cos \theta$
 $h \rightarrow 0 \quad E \rightarrow \infty$

$$c) E_c = H_0 \quad \frac{3}{2} h_c \cos \theta = H_0$$

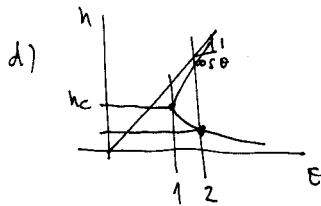
$$\frac{3}{2} \left\{ \frac{q^2}{g \cos \theta} \right\}^{1/3} \cos \theta = H_0$$

$$\Rightarrow q = 2.440 \text{ m}^3/\text{s/m} \quad 1.0 \text{ pts}$$

$$h_c = 0.74 \text{ m}$$

$$\cos \theta = 0.707$$

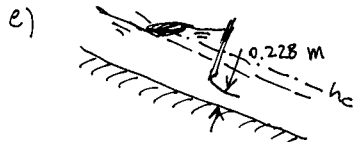
$$H_0 = 1 \text{ m}$$



$$E = 2 = h \cos \theta + \frac{q^2}{2gh^2} \Rightarrow 2 = 0.707 h + \frac{0.296}{h^2}$$

supercritica

$$h = 0.417 \text{ m} \quad 1.01$$



$$E = 5.662 \text{ m} = h \cos \theta + \frac{q^2}{2gh^2} = h \cdot 0.707 + \frac{0.296}{h^2}$$

$$h = 8.283 \text{ m}$$

1.0 pts.