ANSWER SHEET

Problem 1

Problem T1. Focus on sketches *(13 points)*

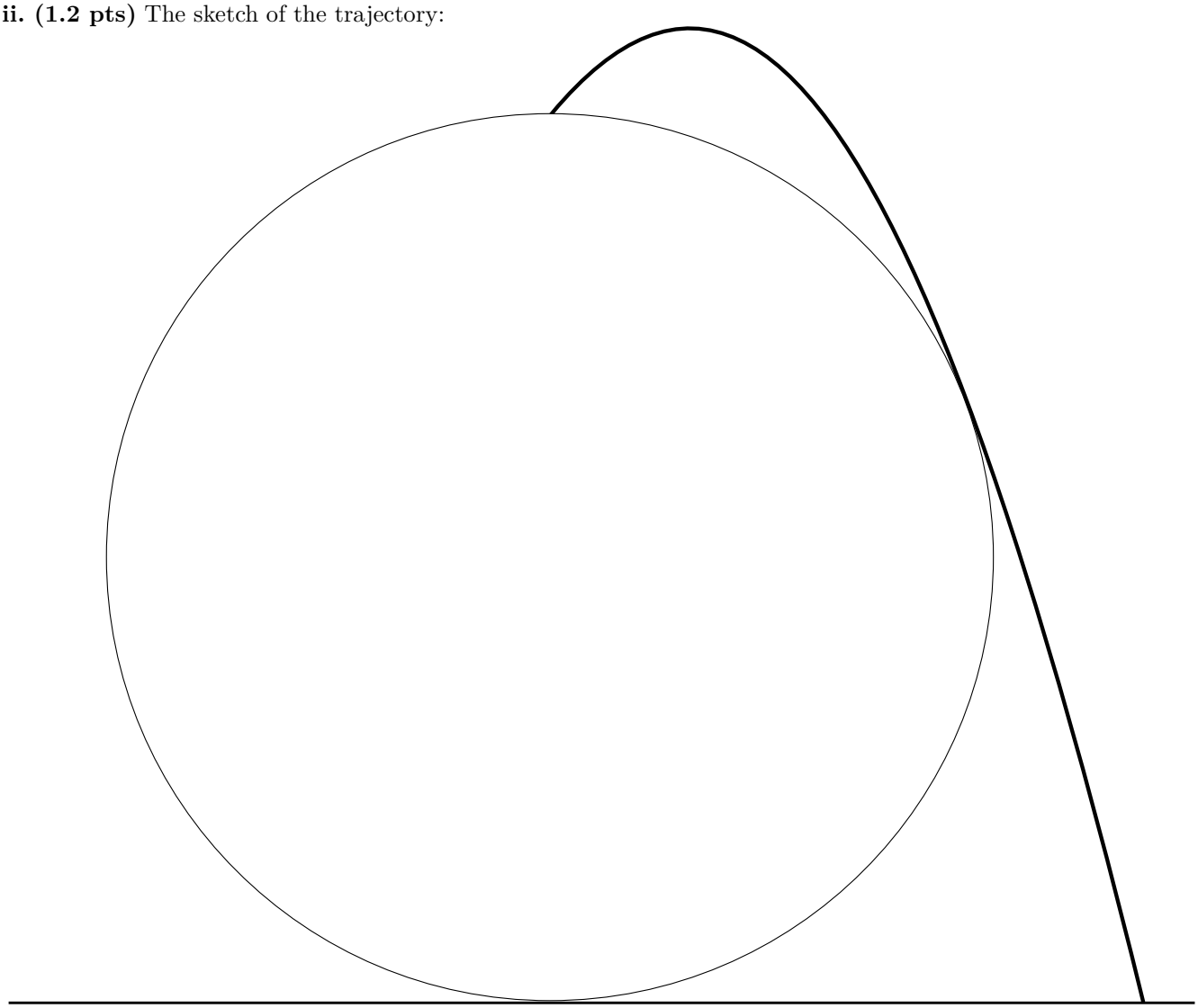
Part A. Ballistics *(4.5 points)*

i. (0.8 pts)

$z_0 = v_0^2/2g$

$k = g/2v_0^2$

ii. (1.2 pts) The sketch of the trajectory:



iii. (2.5 pts)

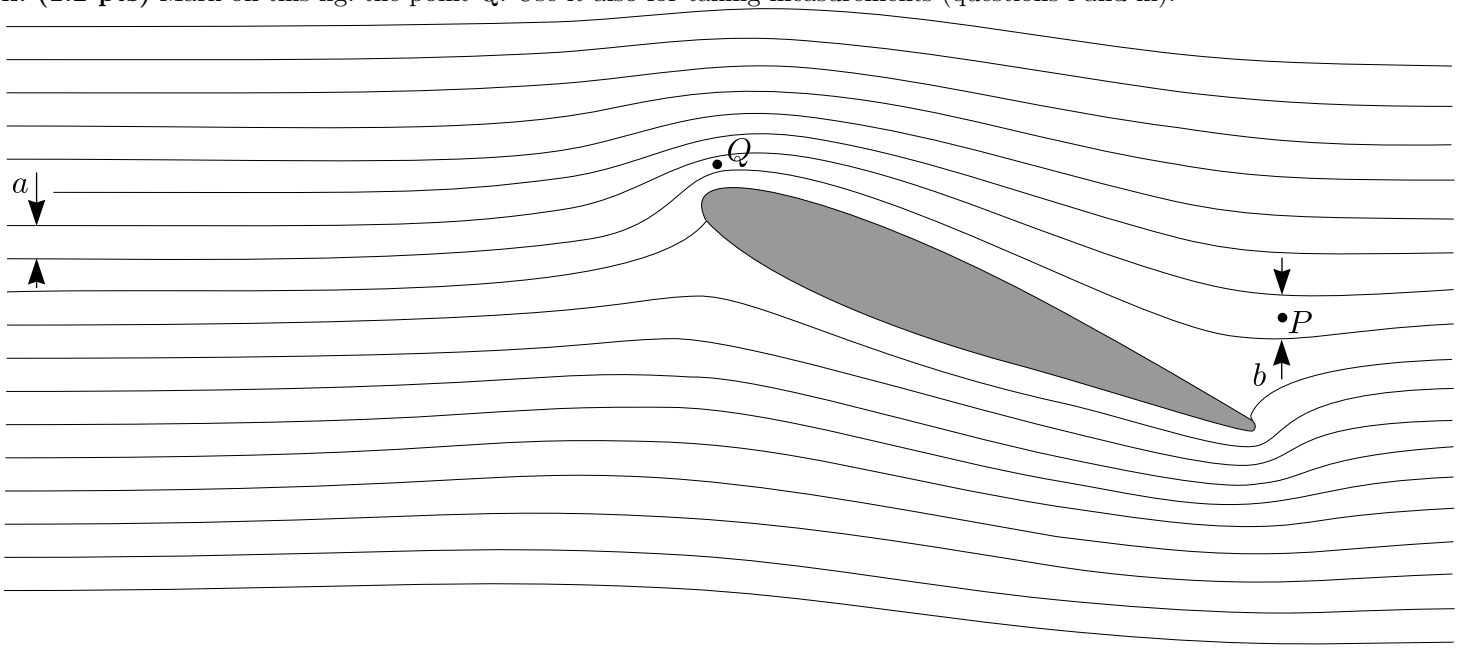
$v_{\min} = 3\sqrt{\frac{gR}{2}}$

Part B. Air flow around a wing *(4 points)*

i. (0.8 pts)

$v_P = 23\,\mathrm{m/s}$

ii. (1.2 pts) Mark on this fig. the point Q. Use it also for taking measurements (questions i and iii).



Formulae motivating the choice of point Q:

$av = \text{const}$

$p + \frac{1}{2}\rho v^2 = \text{const}$

$p^{1-\gamma}T^{\gamma} = \text{const}$

iii. (2.0 pts)

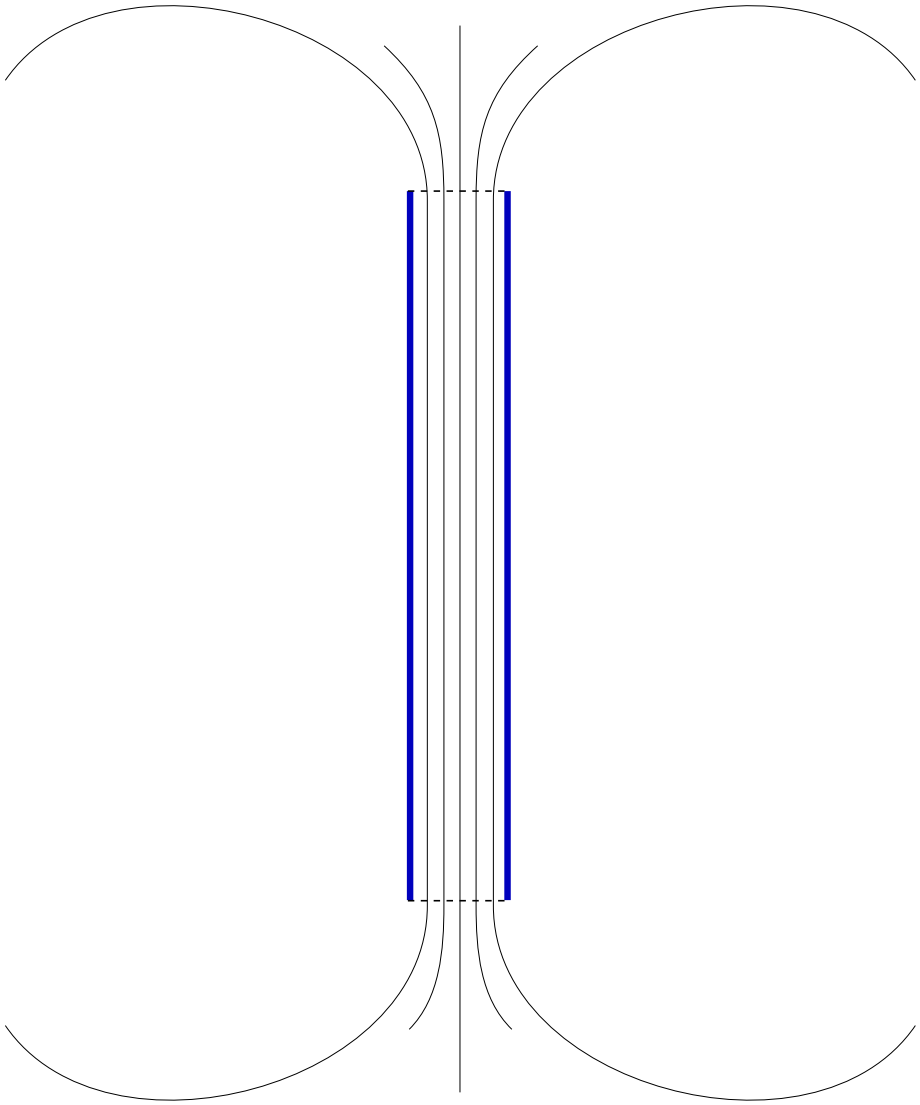
Formula: $v_{\text{crit}} = c\sqrt{\dfrac{2c_p\Delta T}{a^2 - c^2}}$

Numerical: $v_{\text{crit}} \approx 23\,\mathrm{m/s}$

Part C. Magnetic straws *(4.5 points)*

i. (0.8 pts)

Sketch here five magnetic field lines.



ii. (1.2 pts)

$$T = \frac{\Phi^2}{2\mu_0 \pi r^2}$$

iii. (2.5 pts)

$$F = \frac{4-\sqrt{2}}{8\pi\mu_0}\frac{\Phi^2}{l^2}$$