

Esercizio 1

$$\frac{\mathbf{r}_1 - \mathbf{r}_2}{|\mathbf{r}_1 - \mathbf{r}_2|} = \frac{\mathbf{V}_2 - \mathbf{V}_1}{|\mathbf{V}_2 - \mathbf{V}_1|}$$

Esercizio 2

$$t = \frac{l_1 v_1 + l_2 v_2}{(v_1^2 + v_2^2)} \quad ; \quad d_{\text{MIN}} = \frac{|l_1 v_2 - l_2 v_1|}{\sqrt{v_1^2 + v_2^2}}$$

Esercizio 3

1) La barca attraversa il fiume nel minor tempo possibile.

a) $\pi/2$

b) $\frac{L \sqrt{k^2 + 1}}{k}$

c) $\frac{L}{kv}$

2) La barca attraversa il fiume sul tragitto più corto possibile.

a) $\pi/2 + \sin^{-1}\left(\frac{1}{k}\right)$

b) L

c) $\frac{L}{v \sqrt{k^2 - 1}}$

Esercizio 4

$$u = \frac{v' \sqrt{v'^2 - V_0^2} + v'^2 - V_0^2}{V_0}$$

Esercizio 5

$$d = v_0 t \sqrt{2 - \sqrt{3}}$$

Esercizio 6

$$d = \frac{(v_1 + v_2) \sqrt{v_1 v_2}}{g} = 2,47 \text{ m}$$

Esercizio 7

$$t = \frac{2D}{V_0} \quad \text{oppure} \quad t = \frac{2D}{V_0\sqrt{3}} \quad 42,5 \text{ s} \quad \text{oppure} \quad 24,5 \text{ s}$$

Esercizio 8

$$\Delta t = \left(1 - \frac{\sqrt{2}}{2}\right) \frac{2V_0}{g} (\sqrt{3} - 1) = 10,93 \text{ s}$$

Esercizio 9

$$V_0 = \sqrt{\frac{gc^2}{2H} \left(T - \sqrt{\frac{2H}{g}}\right)^2 - \frac{gH}{2}}$$

Esercizio 10

$$v = \sqrt{(1 + b^2) \frac{a}{2c}}$$

Esercizio 11

- a) $y = x - \frac{b}{a} x^2$
- b) $\mathbf{v} = (a, a(1-2bt)) \quad \mathbf{w} = (0, -2ab)$
- c) $t_0 = \frac{1}{b}$

Esercizio 12

- a) $y = -\frac{cx^2}{b^2}$
- b) $\mathbf{v} = (b, -2ct) \quad \mathbf{a} = (0, -2c) \quad v = \sqrt{b^2 + 4c^2t^2} \quad a = 2c$
- c) $\text{tg}(\theta) = \frac{b}{2ct}$
- d) $\langle \mathbf{v} \rangle = (b, -ct) \quad \langle v \rangle = \sqrt{b^2 + c^2t^2}$

Esercizio 13

- a) $S = A\omega t$
- b) $\pi/2$

Esercizio 14

$$x = \frac{k}{2V_0} y^2$$

$$a_X = kV_0 \quad a_T = \frac{k^2 y}{\sqrt{1 + \left(\frac{ky}{V_0}\right)^2}} \quad a_N = \frac{kV_0}{\sqrt{1 + \left(\frac{ky}{V_0}\right)^2}}$$

Esercizio 15

$$V = 2\omega R \quad a = 4\omega^2 R \text{ centripeta}$$

Esercizio 16

$$\text{a) } v = \frac{1}{\frac{1}{v_0} - \frac{t}{R}}$$

$$\text{b) } v = v_0 e^{-\frac{s}{R}}$$

$$\text{c) } a = \sqrt{2} \frac{v^2}{R}$$

$$\text{d) } a = \sqrt{2} \frac{v_0^2}{R} e^{-\frac{2s}{R}}$$

Esercizio 17

$$\text{a) } a_0 = A^2 \omega^2 / R = 2,6 \text{ m/s}^2 \quad a_A = A \omega^2 = 3,2 \text{ m/s}^2$$

$$\text{b) } a_M = A \omega^2 \sqrt{1 - \left(\frac{R}{2A}\right)^2} = 2,5 \text{ m/s}^2 \quad s_M = \pm A \sqrt{1 - \frac{R^2}{2A^2}} = 0,37 \text{ m}$$

Esercizio 18

$$\theta = \arctg(2s/R)$$

Esercizio 19

$$H \approx 600 \text{ m}$$

Esercizio 20

$$\alpha = \arctg\left(\frac{\sin\beta + 1}{\cos\beta}\right) \quad \text{oppure} \quad \alpha = \frac{\pi}{4} + \frac{\beta}{2}$$