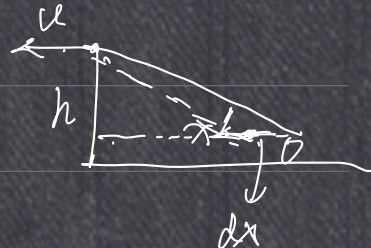


1.6.

$$\theta \triangleq \arctan h/x. \quad v \cos \theta = u \text{ 得船速 } v = u \sec \theta = \frac{u}{x} \sqrt{h^2 + x^2}$$

$$\text{两端对 } t \text{ 求导. 有 } a = -h^2 \frac{uv}{x^2 \sqrt{h^2 + x^2}} = -\frac{u^2 h^2}{x^3}$$

$$\text{故 } v = \frac{u}{x} \sqrt{h^2 + x^2} \quad a = -u^2 h^2 / x^3$$



1.7.

$$i \text{ 方向上: } v_{x0} = 0 \text{ m/s} \quad a_x = -10 \text{ m/s}^2 \quad j \text{ 方向上: } v_{y0} = 10 \text{ m/s} \quad a_y = 0 \text{ m/s}^2$$

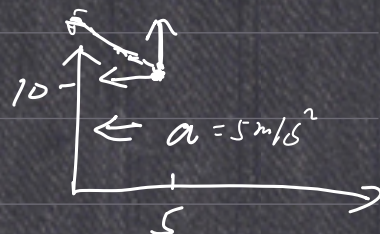
$$(1) \text{ 令 } t=1 \text{ s. } r = 5 \text{ m} \cdot i + 10 \text{ m} \cdot j. \text{ 故 } |r| = 5\sqrt{5} \text{ m}$$

$$(2) v_x = v_{x0} + a_x t \Rightarrow v_x = -10 \text{ m/s} \quad v_y = v_{y0} + a_y t = 10 \text{ m/s}. \text{ 故 } |v| = 10\sqrt{2} \text{ m/s}$$

$$(3) |a| = \sqrt{a_x^2 + a_y^2} = 10 \text{ m/s}^2$$

$$(4) |a_e| = |a| \cos 45^\circ = 5\sqrt{2} \text{ m/s}^2$$

$$(5) |a_n| = |a| \sin 45^\circ = 5\sqrt{2} \text{ m/s}^2$$



1.8.

$$a = \frac{dv}{dt} = -kv^2 \text{ 即 } dv = -kv^2 dt \text{ 有 } \int_{v_0}^v \frac{dv}{v^2} = -k \int_0^t dt$$

$$\text{即 } v = \frac{v_0}{1 + kv_0 t} \text{ 同时对其积分. } x = \int_0^t \frac{v_0}{1 + kv_0 t} dt = \frac{1}{k} \ln |1 + kv_0 t|$$

$$\text{故 } v = v_0 / (1 + kv_0 t) \quad x = \frac{1}{k} \ln |1 + kv_0 t|$$

1.17.

$$(1) \text{ 此时 } v_0 = at = -2.4 \text{ m/s}$$

相对升降机. 虫子的初速度为 0. 加速度为 $a+g$

$$\frac{1}{2}(a+g)t^2 = h \Rightarrow t = \frac{3\sqrt{3}}{2\sqrt{14}} \text{ s} \text{ 故需 } t = 3\sqrt{3}/2\sqrt{14} \text{ s}$$

$$(2) v_0 = -2.4 \text{ m/s} \quad a = g = 10 \text{ m/s}^2$$

$$x = v_0 t + \frac{1}{2} at^2 \Rightarrow x = \left(\frac{135}{56} - \frac{18\sqrt{3}}{5\sqrt{14}} \right) \text{ m}$$

1.18

$$(1) V = \sqrt{V_{\text{抛}}^2 - V_{\frac{t}{2}}^2} \Rightarrow V = 2\sqrt{2} \text{ m/s}$$

$$(2) \tan\theta = V/V_{\frac{t}{2}} = \frac{\sqrt{2}}{10} \quad \theta = \arctan \frac{\sqrt{2}}{10}$$

1.20

$$(1) \text{在 } K \text{ 系中. } v_x = -4.95 \text{ m/s} \quad v_y = 19.8 \text{ m/s} \quad a_x = 0 \quad a_y = -9.9 \text{ m/s}^2$$

$$x = (-4.95t) \text{ m} \quad y = (19.8t - \frac{1}{2} \times 9.9t^2) \text{ m. 消去 } t.$$

$$\text{有: } y = -2x^2 - 4x$$

(2).

$$\text{在 } K \text{ 系中. } a = g = 9.8 \text{ m/s}^2. \text{ 竖直向下.}$$

$$\text{在 } K' \text{ 系中. } a = g = 9.8 \text{ m/s}^2. \text{ 竖直向下.}$$