Exercises in Physics
Assignment # 3

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P1.

$v_x = \frac{dx}{dt} = 6t - 4$

$v_y = \frac{dy}{dt} = 8t - t^2$

$a_x = \frac{dv_x}{dt} = 6$

$a_y = \frac{dv_y}{dt} = 8 - 2t$

$a = \sqrt{{a_x}^2 + {a_y}^2}$

$= \sqrt{6^2 + (8 - 2 \times 2)^2}$

$= 2\sqrt{13}$

$v = \sqrt{{v_x}^2 + {v_y}^2}$

$= \sqrt{(6 \times 2)^2 + (8 \times 2 - 2^2)^2}$

$= \sqrt{(6 \times 2)^2 + (8 \times 2 - 2^2)^2}$

$= 12\sqrt{2}$

P3.

$\theta = 50°$

$t = \frac{x}{{v_x}^2} = \frac{4}{v_0 \cos 50} = \frac{4}{0.643 v_0}$

$y = y_0 + y_{0yt} + \frac{1}{2} g t^2$

$3 = 2.1 + 0.643 v_0 \cdot \frac{4}{0.643 v_0} - \frac{1}{2} \times 9.8 \frac{4}{0.643 v_0}^2$

$$3 = 6.1 - 4.9 \times \frac{4}{0.643v_0}^2$$
$$\frac{4}{0.643v_0}^2 = \frac{3.1}{4.9}$$
$$\frac{4}{0.643v_0} = \sqrt{\frac{3.1}{4.9}}$$
$$0.643v_0 = 5.03m/s$$
$$v_0 = 7.821m/s$$

P4.

$$v_0 = 30m/s$$
$$2\alpha - \phi = \cos^{-1}\frac{\frac{gx^2}{{v_0}^2} - h}{\sqrt{h^2 + x^2}}$$
$$\phi = \tan^{-1}\frac{x}{h}$$

$$\phi = \tan^{-1}\frac{110}{24} = 77.69°$$
$$2\alpha - \phi = \cos^{-1}\frac{\frac{9.8 \times 110^2}{30^2} - 110}{\sqrt{24^2 + 110^2}}$$
$$2\alpha - \phi = 78.85°$$
$$2\alpha = 156.54$$
$$\alpha = 78.27°$$