No Uji Pemahaman
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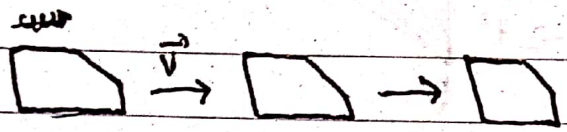
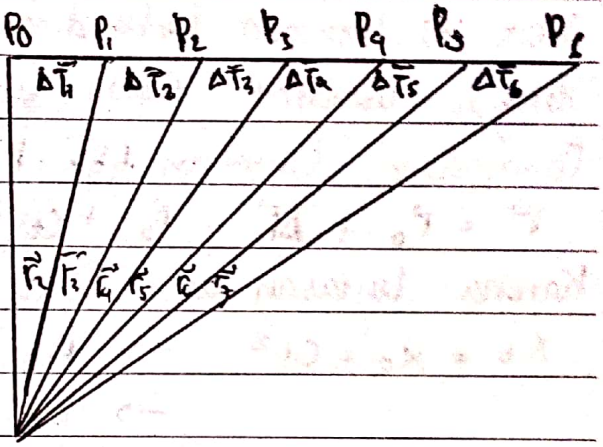
NPM : 2013020002
Kelas : B

1. Gerak Lurus Beraturan





$P_0, P_1, P_2, P_3, P_4, P_5$, dan P_6 merupakan posisi benda saat $t_0, t_1, t_2, t_3, t_4, t_5, t_6$ dg vektor posisi terhadap θ yaitu $\vec{r}_1, \vec{r}_2, \vec{r}_3, \ldots$ dan perpindahan $\Delta\vec{r}_1$, $\Delta\vec{r}_2, \Delta\vec{r}_3, \ldots$ $\Delta\vec{r}_1$ ditempuh dalam waktu $\Delta t_1 = t_1 - t_0$

$\Delta\vec{r}_2$ ditempuh dalam waktu $\Delta t_2 = t_2 - t_1$, dst

Karena benda bergerak lurus beraturan, maka :

$\Delta r_1 = \Delta r_2 = \Delta r_3 = \ldots = \Delta\vec{r}$ } konstan
$\Delta t_1 = \Delta t_2 = \Delta t_3 = \ldots = \Delta t$ }

*) Persamaan lintasan di titik P $\rightarrow \vec{r} = \vec{r}_0 + \Delta\vec{r} = \vec{r}_0 + \Delta\vec{r}\,\hat{e}r$

$\hat{e}r$ = vektor satuan perpindahan $\Delta\vec{r}$

$\Delta\vec{r}$ = tetap dalam selang waktu Δt yg sama

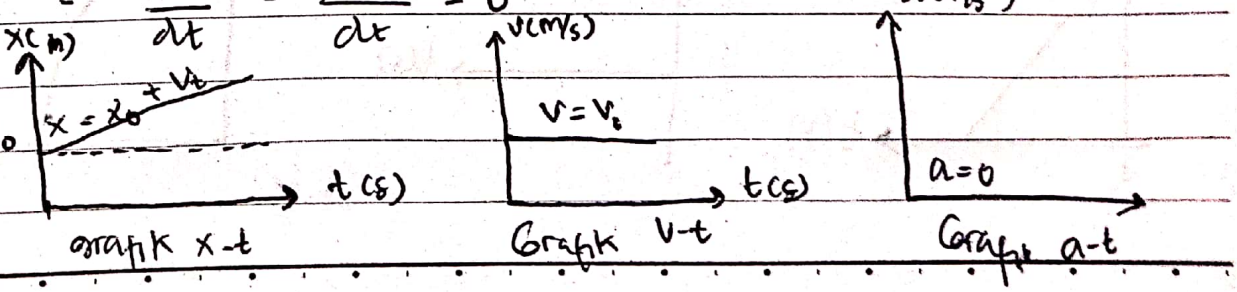
*) Kecepatan gerak dalam selang $\Delta t \rightarrow v = \frac{\Delta r}{\Delta t}$ = konstan, $\Delta r = v \cdot \Delta t$

sehingga vektor posisi menjadi $\vec{r} = \vec{r}_0 + vt\,\hat{e}r$

$x(t) = v(x) \cdot t$ atau $y(t) = v_y \cdot t$

$v(t) = \frac{dx(t)}{dt} = v_x = C$ = konstan

$a_b = \frac{dv_t}{dt} = \frac{d(c)}{dt} = 0$



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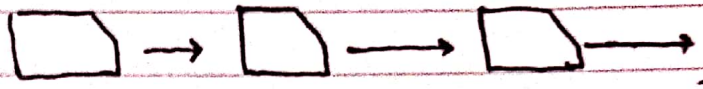
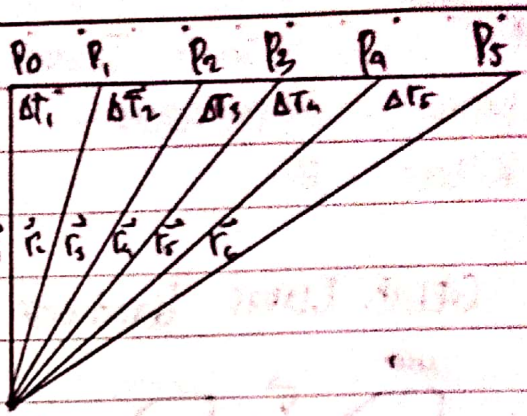
2. Gerak Lurus Berubah Beraturan





Jarak yg ditempuh berbanding lurus dengan kuadrat waktu, maka : $x = C.t^2$

Persamaan lintasan titik P

$\vec{r} = \vec{r}_0 + \Delta\vec{r} = \vec{r}_0 + Ct^2\hat{i}$

Karena lintasan lurus, maka ditulis tanpa tanda vektor

$x_t = x_0 + Ct^2$ → Pers. kecepatan benda $v_t = \frac{dx}{dt} = 2Ct$

→ Pers. percepatan benda $a_t = \frac{dv_t}{dt} = 2C$

Tetapi, jika benda bergerak dg kecepatan awal V_0, persamaan menjadi :

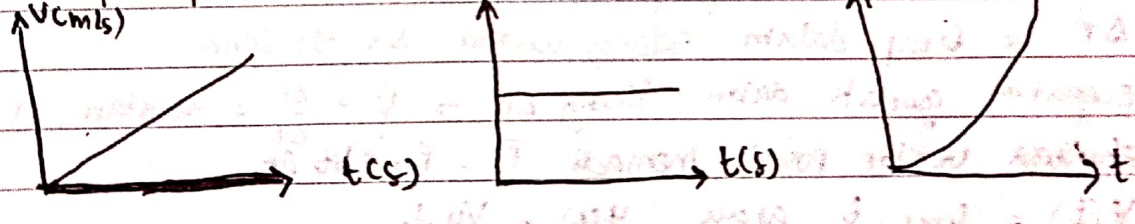
$x = x_0 + v_0 t + \frac{1}{2}at^2$ atau $s = s_0 + v_0 t + \frac{1}{2}at^2$

$V_x = V_0 + at$ atau $V = V_0 + at$

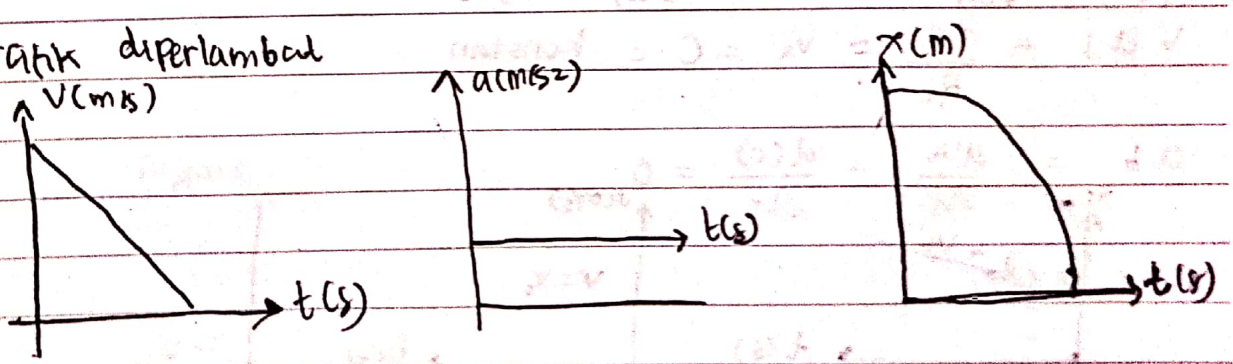
$V_x^2 = V_0^2 + 2a(x - x_0)$ $V_t^2 = V_0^2 + 2a(s - s_0)$

$V_{(t)} = \frac{V_0 + V_x}{2}$ $V_t = \frac{V_0 + V}{2}$

Grafik Dipercepat



Grafik diperlambat



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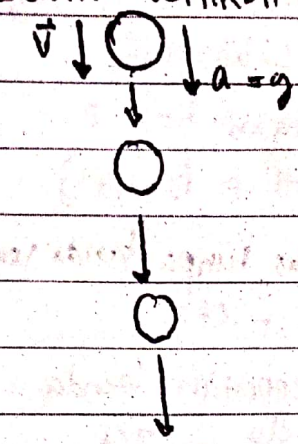
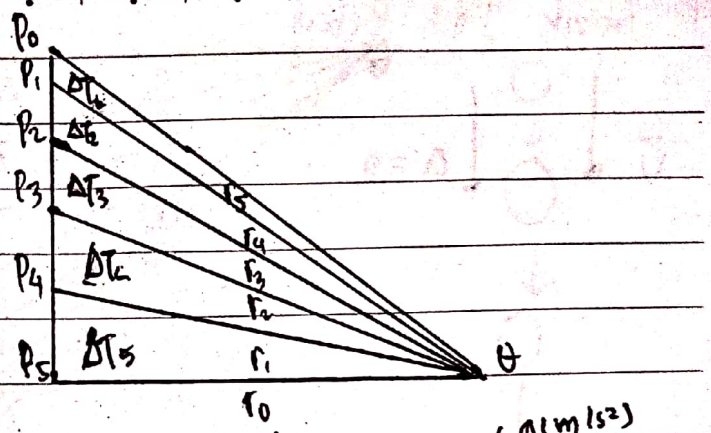
3. Gerak Vertikal ke Bawah

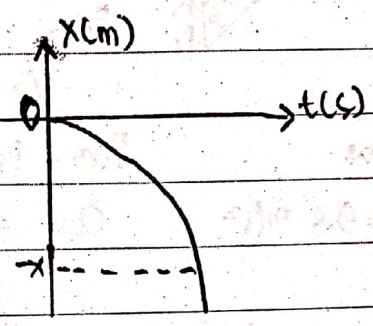


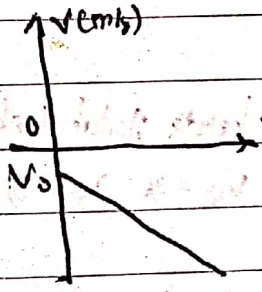


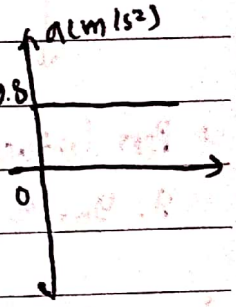
$V_t = V_0 + gt$

$V_t^2 = V_0^2 + 2gh$

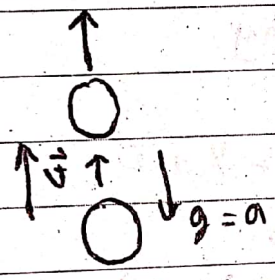
$h = V_0 t + \frac{1}{2} g t^2$

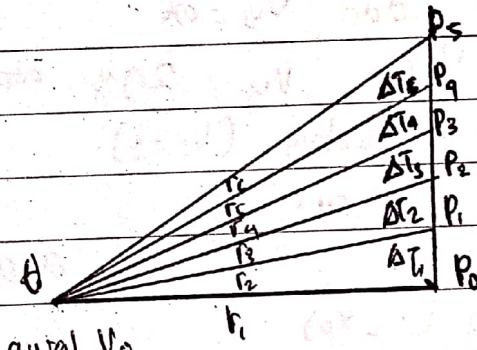






4) Gerak Vertikal ke Atas





Ketika bergerak dg kecepatan awal V_0,

Pers. lintasannya : $x = x_0 + V_0 t + \frac{1}{2} a t^2$

$V_x = V_0 + a$

$V_x^2 = V_0^2 + 2a(x - x_0)$

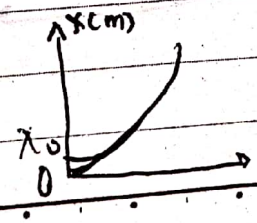
$V_r = \frac{V_0 + V_x}{2}$

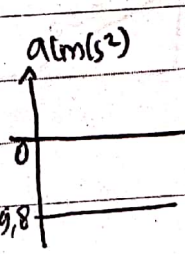
Ketika benda bergerak tanpa kecepatan awal $V_0 = 0$, persamaannya :

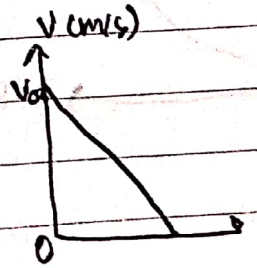
$x = x_0 + \frac{1}{2} a t^2$

$V_x = at$

$V_x^2 = 2a(x - x_0)$







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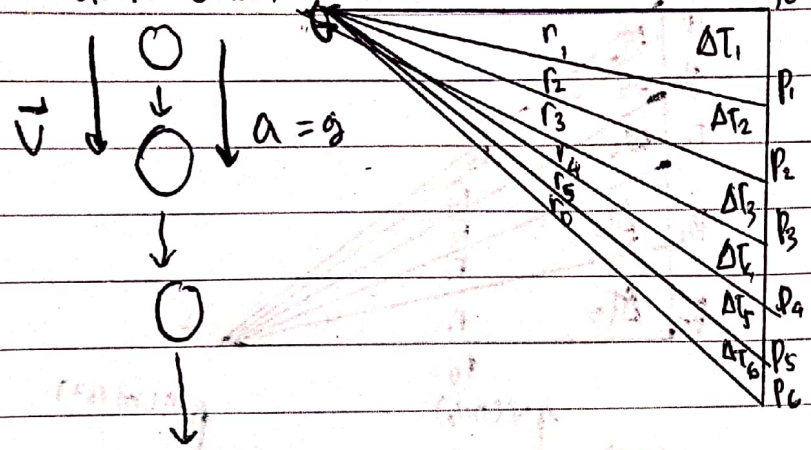
5. Gerak Jatuh Bebas



P_0 Jarak berbanding lurus dg t^2

$y = ct^2$ (c = konstan)

Pers. lintasan titik P

$\vec{r} = \vec{r}_0 + \vec{s} = \vec{r}_0 + ct^2\hat{j}$

dapat ditulis tanpa tanda vektor

$y = y_0 + ct^2$

Pers. kecepatan benda

$v_y = \frac{dy}{dt} = 2ct$

Pers. Percepatan benda

$a_y = \frac{dv_y}{dt} = 2c = g \rightarrow c = \frac{1}{2}g$

* Pers. Lintasan benda jatuh bebas:

$y = y_0 + \frac{1}{2}gt^2$, $v_y = gt$, $a_y = g = 9{,}8\ m/s^2$

Jika ditinjau pada titik hijau yg berhimpit dg P_0

$y = \frac{1}{2}gt^2$ dan $v_y = gt$

Jadi, $t = v_y/g$, $v_y = 2gy$ atau $v_y = \sqrt{2gy}$

.) Benda jatuh bebas ($V_0 = 0$)

$x = x_0 t + \frac{1}{2}at^2$

$v_x = at$

$v_x^2 = 2a(x - x_0)$

atau $s = s_0 + \frac{1}{2}at^2$

$v = at$

$v^2 = 2a(s - s_0)$

.) Benda jatuh bebas (V_0)

$x = x_0 + v_0 t + \frac{1}{2}at^2$

$v_x = v_0 + at$

$v_x^2 = v_0^2 + 2a(x - x_0)$

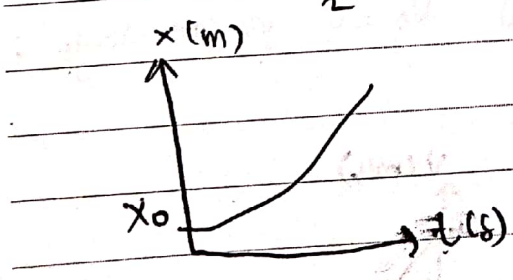
$v_r = \frac{v_0 + v_x}{2}$

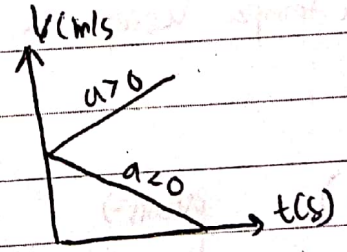
atau $s = s_0 + v_0 t + \frac{1}{2}at^2$

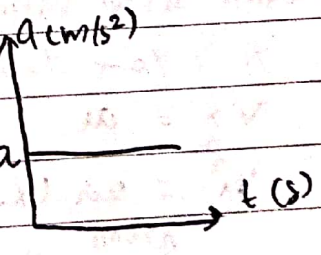
$v = v_0 + at$

$v^2 = v_0^2 + 2a(s - s_0)$

$v_r = \frac{v_0 + v}{2}$







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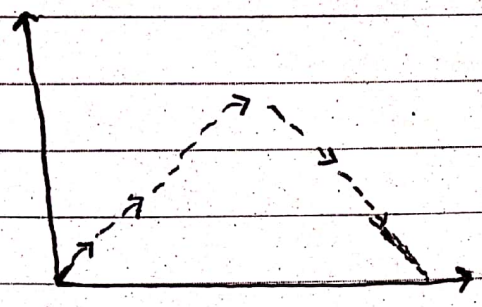
6. Gerak Parabola



Keterangan :

V_0 = kecepatan awal (m/s)

V_x = kecepatan arah sumbu x (m/s)

V_y = kecepatan arah sumbu y (m/s)

x = posisi di sumbu x (m)

y = posisi di sumbu y (m)

θ = sudut elevasi

g = percepatan gravitasi (m/s^2)

•) Kecepatan di Sembarang Titik

$V = \sqrt{(V_x)^2 + (V_y)^2}$	Kecepatan (V_x, V_y)	
	sumbu x	sumbu y
kondisi awal	$V_0 \cos\theta$	$V_0 \sin\theta$
saat t sekon	$V_0 \cos\theta$	$V_0 \sin\theta - gt$

•) Kecepatan saat t sekon

	Reduldukan (x;y)		
	Sumbu x	Sumbu y	Waktu
Reduldukan awal	0	0	0
saat t sekon	$x = V_0 \cos\theta . t$	$y = V_0 \sin\theta \, t - \frac{1}{2} g t^2$	t
Pd titik tertinggi	$X = \frac{V_0^2 \sin 2\theta}{g}$	$y_{max} = \frac{V_0^2 \sin^2\theta}{2g}$	$t = \frac{V_0 \sin\theta}{g}$
Pd titik terjauh	$X_{max} = \frac{V_0^2 \sin 2\theta}{g}$	0	$t = 2 \cdot \frac{V_0 \sin\theta}{g}$