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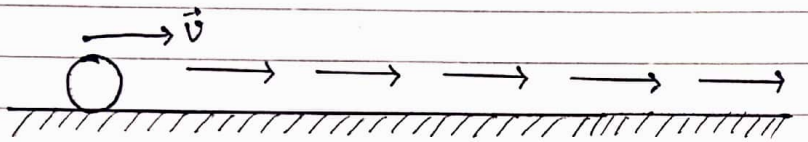
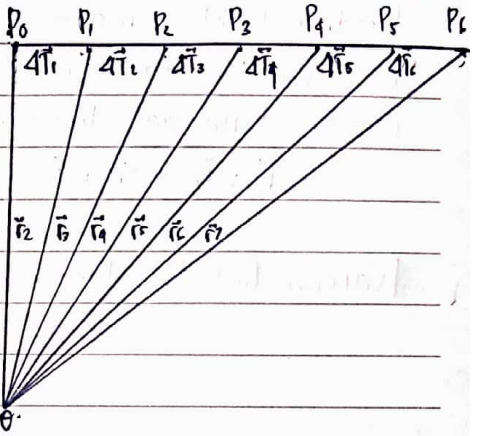
NPM : 2013022018.
Kelas : B.
Prodi : Pendidikan fisika
Tugas Mekanika Pemahaman materi Konsep I.

1). Gerak Lurus Beraturan.





$P_0, P_1, P_2, P_3, P_4, P_5$, dan P_6 merupakan posisi benda saat $t, t_1, t_2, t_3, t_4, t_5$ dan t_6 dengan vektorpostsi terhadap O yaitu $\vec{r}_2, \vec{r}_3, \vec{r}_4, \vec{r}_5, \vec{r}_6, \vec{r}_7$, dan perpindahan $\Delta\vec{r}_1, \Delta\vec{r}_2, \Delta\vec{r}_3, \Delta\vec{r}_4, \Delta\vec{r}_5, \Delta\vec{r}_6$. Δr_1 ditempuh dalam waktu $\Delta t_1 = t_1 - t$. $\Delta t_2 = t_2 - t_1$ dimana nilainya konstan.

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

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

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

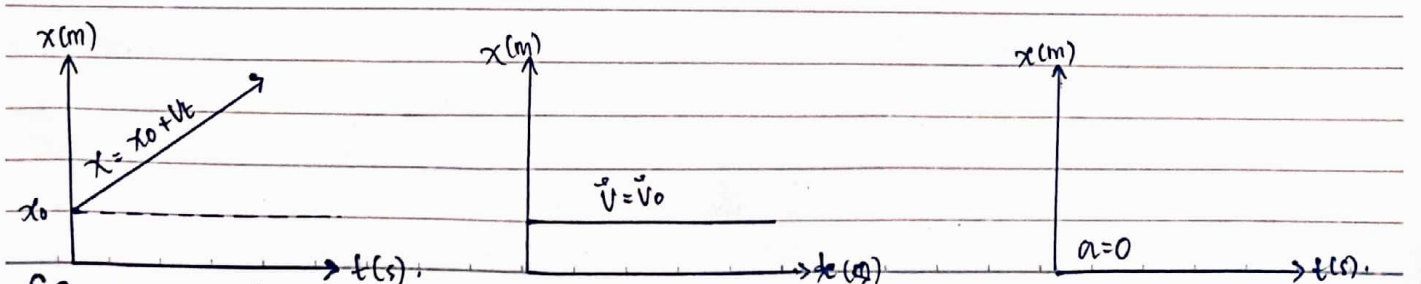
Kecepatan gerak dalam selang Δt → $V = \frac{\Delta\vec{r}}{\Delta t}$ = konstan. , $\Delta\vec{r} = V \cdot \Delta t$

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

$x(t) = V(x) \cdot t$ atau $Y(t) = v_y \cdot t$.

$V(t) = \frac{dx_t}{dt} = Vx$ = konstan.

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



(Grafik x-t). (grafik v-t). (grafik a-t).

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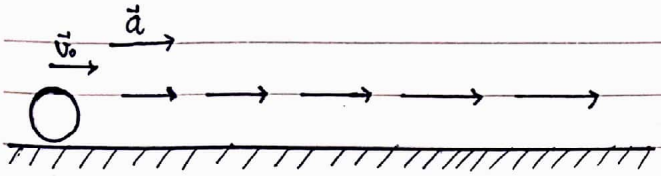
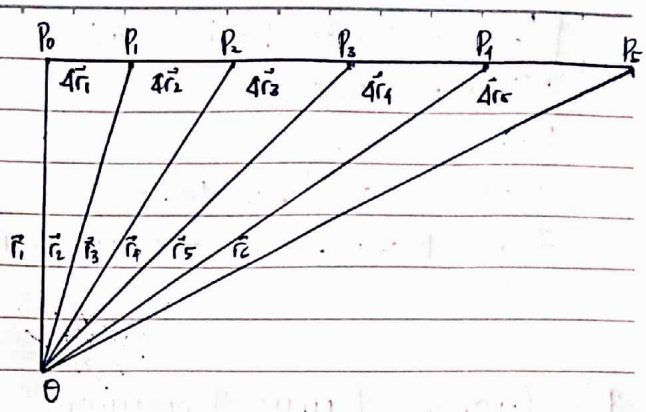
2). Gerak Lurus Berubah Beraturan.





Jarak yang ditempuh berbanding lurus dengan kuadrat waktu, maka, $x = c \cdot t^2$ dengan c adalah konstanta yang tak bergantung pada waktu. Persamaan lintasan titik P adalah

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

Karena lintasan lurus, maka ditulis tanpa tanda vektor → $x_t = x_0 + ct^2$

- Persamaan Kecepatan benda $v_t = \frac{dx}{dt} = 2ct$
- Persamaan Percepatan benda $a_t = \frac{dv_t}{dt} = 2c$

Tetapi jika benda bergerak dengan kecepatan awal v_0 persamaannya menjadi

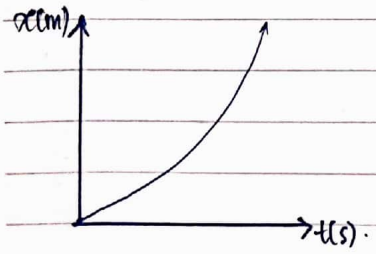
$x = x_0 + v_0 t \pm \frac{1}{2} at^2$ | $s = s_0 + v_0 t \pm \frac{1}{2} at^2$

$v_x = v_0 + at$ | $v = v_0 + at$

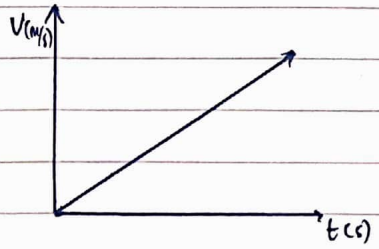
$v_x^2 = v_0^2 + 2a(x - x_0)$. (atau) $v^2 = v_0^2 + 2a(s - s_0)$.

$v_{(t)} = \frac{v_0 + v_x}{2}$ | $v_r = \frac{v_0 + v}{2}$

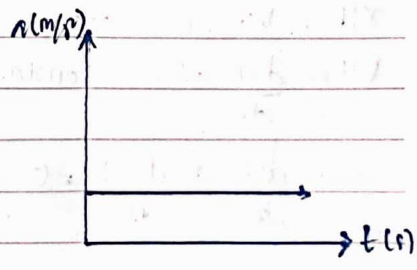
Grafik Gerak Lurus Berubah Beraturan Dipercepat



Grafik x - t



Grafik v - t



Garafik a - t.

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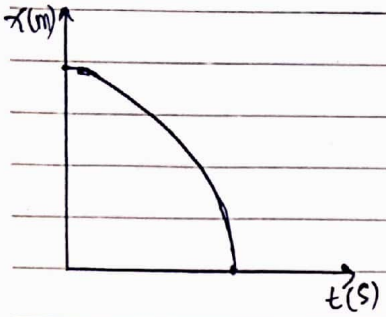
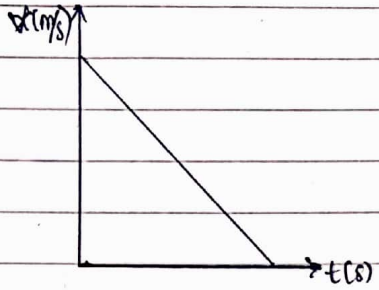
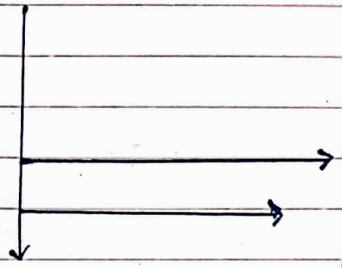
Grafik Gerak Lurus Berubah Beraturan Diperlambat.



Grafik x-t

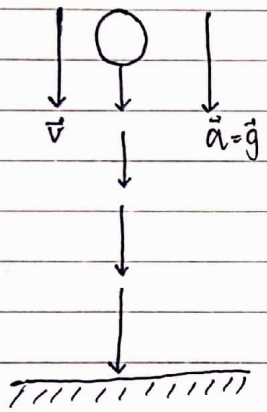


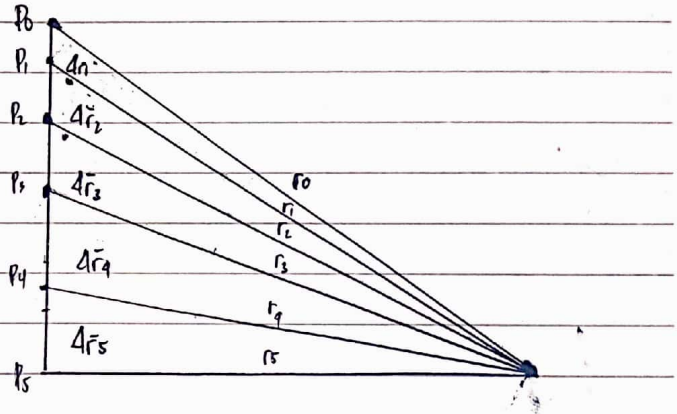
Grafik v-t



Grafik a-t.

3). Gerak Vertikal ke Bawah. (GVB).





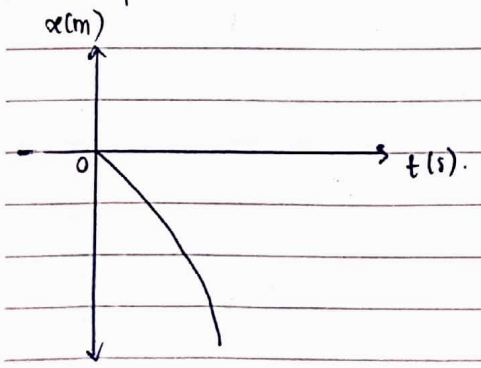
Rumus-:

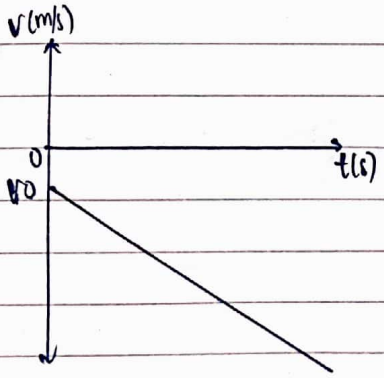
$h = v_0 t + \frac{1}{2} g t^2$

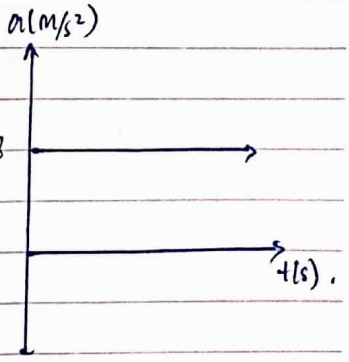
$v_t = v_0 + gt$

$v_t^2 = v_0^2 + 2gh$.

Grafik GVB.







Grafik h terhadap t.

Grafik v terhadap t.

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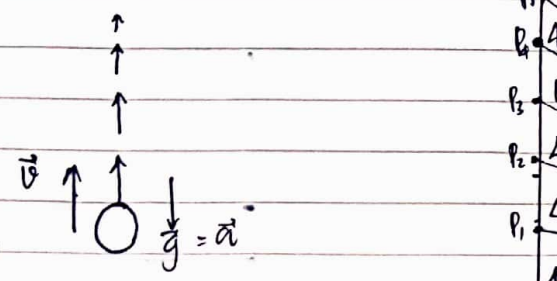
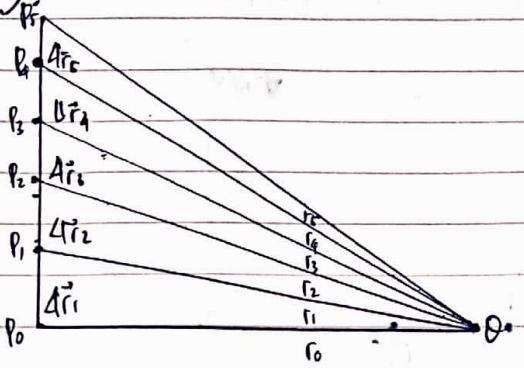
4). Gerak Vertikal ke Atas (GVA)

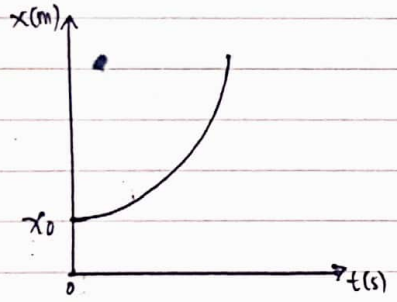




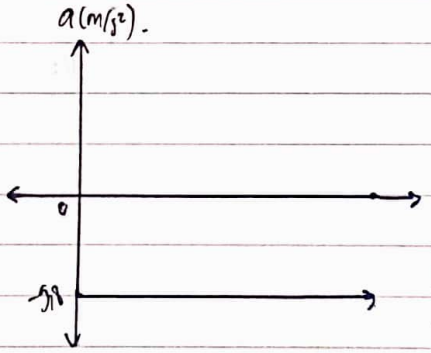
Benda bergerak dengan kecepatan awal V_0,

$$x = x_0 + V_0 t - \tfrac{1}{2} a t^2.$$
$$V_x = V_0 - gt$$
$$V_x^2 = V_0^2 - 2g(x - x_0).$$
$$V_r = \frac{V_0 + V_x}{2}.$$

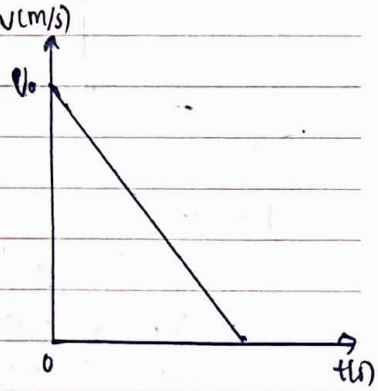
Grafik GVA.



Grafik x-t



grafik a-t



grafik v-t

5). Gerak Jatuh Bebas.

Pada gerak jatuh bebas. Jarak berbanding lurus dengan kuadrat waktu

$y = ct^2$ dengan c = konstan.

Persamaan lintasan titik P.

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

dapat ditulis tanpa tanda vektor

$$y = y_0 + ct^2.$$

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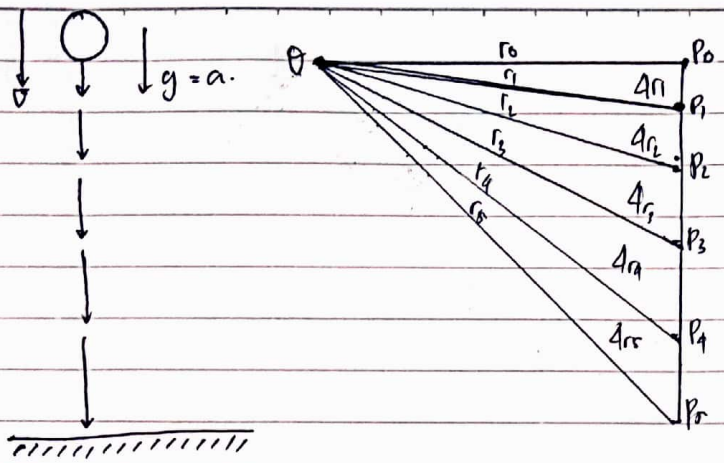

Persamaan Kecepatan benda.

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

Persamaan Percepatan benda.

$$a_y = \frac{dV_y}{dt} = 2c = g \quad c = \tfrac{1}{2}g$$

Persamaan lintasan benda jatuh bebas menjadi.

$$y = y_0 + \tfrac{1}{2}gt^2. \qquad V_y = gt \qquad a_y = g = 9{,}8\,m/s^2$$

Jika dihitung pada titik hitung yg berimpit dg P_0

$$y = \tfrac{1}{2}gt^2 \quad \text{dan} \quad V_y = gt$$

Jadi $t = \frac{V_y}{g}$, $V_y^2 = 2gy$ atau $V_y = \sqrt{2gy}$.

Benda jatuh Bebas $V_0 = 0$.

$x = x_0 t + \tfrac{1}{2}gt^2$ atau $s = V_0 t + \tfrac{1}{2}at^2$

$V_x = at$ atau $V = at$

$V_x^2 = 2a(x - x_0)$. $V^2 = 2a(s - s_0)$.

Benda Jatuh bebas V_0.

$x = x_0 + V_0 t + \tfrac{1}{2}at^2$ atau $s = V_0 t + s_0 + \tfrac{1}{2}at^2$

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

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

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

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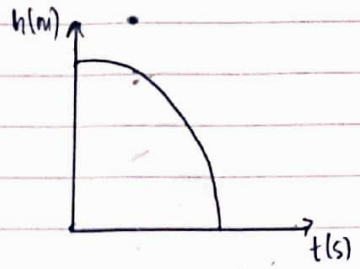
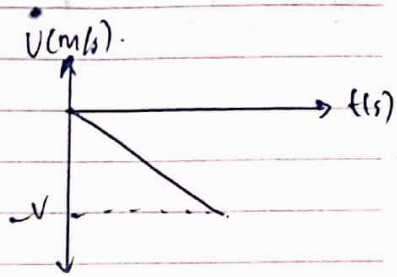
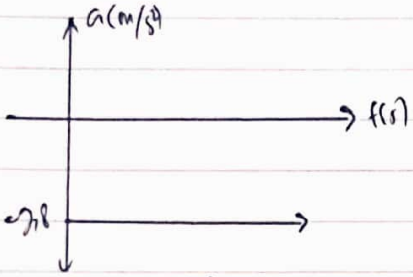
Grafik Gerak Jatuh bebas.



Grafik ketinggian thdp waktu

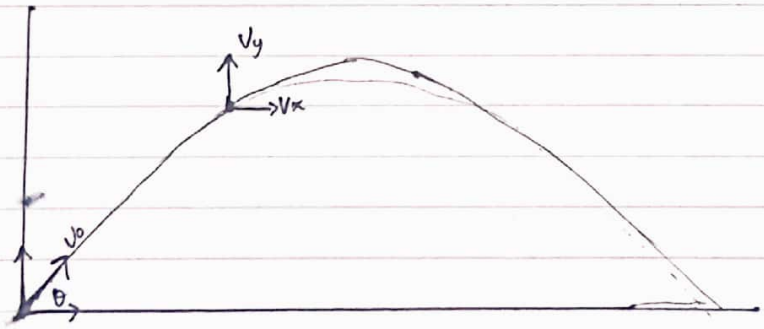


Grafik kecepatan terhadap waktu..



Grafik Percepatan terhadap waktu.

6). Gerak Parabola.



Kecepatan pada sembarang titik

$$V = \sqrt{Vx^2 + Vy^2}$$

dengan

$Vx = Vo \cdot \cos\theta \cdot t$

$Vy = Vo \cdot \sin\theta - gt$

Kondisi	Sumbu x	Sumbu y	Waktu
Pada t sekon.	$x = Vo \cdot \cos t$	$y = Vo \sin\theta \cdot t - \frac{1}{2}gt^2$	t
Pada titik tertinggi	$x = \frac{Vo^2 \sin 2\theta}{g}$	$y_{max} = \frac{Vo^2 \sin^2\theta}{2g}$	$t = \frac{Vo \cdot \sin\theta}{g}$
Pada titik Tegauh.	$x_{max} = \frac{Vo^2 \sin 2\theta}{g}$	0	$t = \frac{2Vo \sin\theta}{g}$