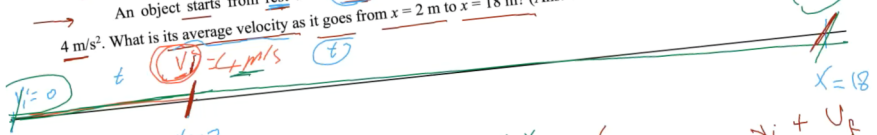
Ch 2

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

An object starts from rest at the origin and moves along the x axis with a constant acceleration of 4 m/s². What is its average velocity as it goes from $x = 2$ m to $x = 18$ m? (Ans: 8 m/s)



$V_f^2 = V_i^2 + 2a\Delta x$

$= 0 + 2(4)^2$

$= 16$

$V_f = 4$ m/s

$V_f^2 = V_i^2 + 2a\Delta x$

$= 0 + 2(4)(18)$

$= 144$

$V_f = 12$ m/s

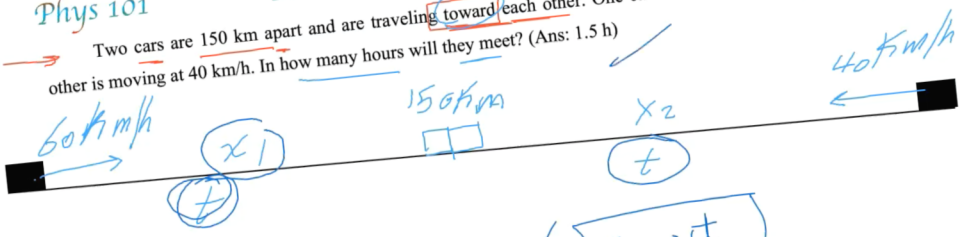
$V_{avg} = \frac{V_i + V_f}{2}$

$= \frac{4 + 12}{2}$

$V_{avg} = 8$ m/s

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

Two cars are 150 km apart and are traveling toward each other. One car is moving at 60 km/h and the other is moving at 40 km/h. In how many hours will they meet? (Ans: 1.5 h)



$x_1 + x_2 = 150$

$60t + 40t = 150$

$100t = 150$

$t = 1.5$ h

$x = vt$

$x_1 = 60t$

$x_2 = 40t$

شاهد الشرح هنا

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

A stone and a ball are thrown vertically upward with different initial speeds: 20 m/s for the stone and 10 m/s for the ball. If the maximum height reached by the ball is H, what is the maximum height reached by the stone? (Ans: 4 H)

ball

$\Delta y = \frac{v^2}{2g} = \frac{10^2}{2(10)} = \frac{10 \times 10}{2 \times 10} = 5\ m = H$

stone

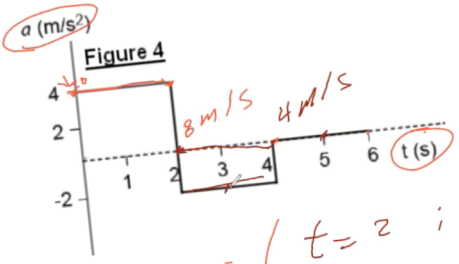
$\Delta y = \frac{v^2}{2g} = \frac{20 \times 20}{2 \times 10} = 20\ m = 4 \times 5m$

$= 4\ H$

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

A particle starts from rest at $t = 0$ s. Its acceleration as a function of time is shown in figure 4. What is its speed at the end of the 6.0-s interval? (Ans: 4.0 m/s)

Figure 4



$t = 0 : t = 2s$

$v_f = v_i + at$

$= 0 + 4(2)$

$= 8\ m/s$

$t = 2 : t = 4$

$v_f = v_i + at$

$= 8 + (-2)(2)$

$= 4\ m/s$

$t = 4 : t = 6$

$a = 0$

v constant

$v = 4\ m/s$





شاهد الشرح هنا

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

The position of a particle as a function of time is described by the equation: $x(t) = 2.0 + 3.0\,t - t^3$, where x is in m and t is in s. What is the maximum positive position of the particle on the x axis? (Ans: 4.0 m)

$v = 0$ at t

$v = \frac{dx}{dt} = 3 - 3t^2 = 0$

$3t^2 = 3$

$t = 1$ s

$x(1) = 2 + 3(1) - 1^3 = 4$ m

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

A stone is thrown vertically downward from a building with an initial speed of 2.0 m/s. It reaches the ground after 5.0 s. What is the height of the building? (Ans: 130 m)

$v_i = -2$ m/s

$\Delta t = 5$ s

$\Delta y = v_i t + \frac{1}{2} a t^2$

$= (-2)(5) + \frac{1}{2}(-9.8)(5)^2$

$= -132.5$ m

$h = 132.5$ m





شاهد الشرح هنا

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

Each of the following four particles move along an x axis. Their coordinates as functions of time are given by: particle 1: $x(t) = 3.5 - 2.7t^4$; particle 2: $x(t) = 3.5 + 2.7t^3$; particle 3: $x(t) = 3.5 + 2.7t^2$; and particle 4: $x(t) = 3.5 - 3.4t - 2.7t^2$. Which of these particles have constant acceleration? (Ans: Only 3 & 4)

① $v = \frac{dx}{dt} = -10.8\,t^3$ $\quad a = \frac{dv}{dt} = -32.4\,t^2$ not constant

② $v = \frac{dx}{dt} = 8.1\,t^2$ $\quad a = \frac{dv}{dt} = 16.2\,t$ not constant

③ $v = \frac{dx}{dt} = 5.4\,t$ $\quad a = \frac{dv}{dt} = 5.4$ constant

④ $v = \frac{dx}{dt} = -3.4 - 5.4t$ $\quad a = \frac{dv}{dt} = -5.4$ constant

Constant does not depend on time

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

Starting at time $t = 0$, an object moves along a straight line. Its coordinate in meters is given by: $x(t) = 75t - 1.0t^3$, where t is in s. When the velocity of the object is zero, what is the value of its acceleration? (Ans: -30 m/s^2)

$v = \frac{dx}{dt} = 75 - 3t^2$

$75 - 3t^2 = 0$

$\frac{75}{3} = \frac{3t^2}{3}$

$t^2 = 25$

$t = 5$ s

$a = \frac{dv}{dt} = -6t$

$a = -30$ m/s^2





شاهد الشرح هنا

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

A man runs on a straight road for 8.0 km at a speed of 8.0 km/h. He then continues in the same direction for another 6.0 km at a speed of 12 km/h. What is his average speed during this 14-km run? (Ans: 9.3 km/h)

8 Km/h | 6 Km 12 Km/h

8 Km

$t_1 = \frac{\Delta x}{v} = \frac{8}{8} = 1\ h$

$t_2 = \frac{\Delta x}{v} = \frac{6}{12} = 0.5\ h$

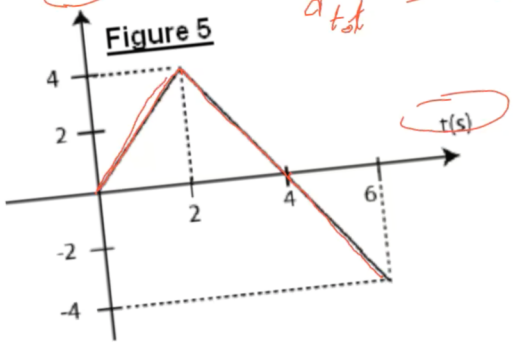
$V_{avg} = \frac{\Delta x}{\Delta t} = \frac{14}{1.5} = 9.33\ Km/h$

Phys 101 Mr.Abdullah Mohamed @Chem31Phys

A particle moves along the x axis. Its position from its starting point as a function of time t is shown in figure 5. What is the total distance that this particle travels from $t = 0$ to $t = 6.0$ s? (Ans: 12 m)

$d_{tot} = 4 + 8 = 12\ m$

Figure 5







شاهد الشرح هنا