# 4.2 – Straight-Line Motion: Connecting Position, Velocity and Acceleration Clue Game

Oh no! A murder has been committed. The Amazing Spiderman has been found dead and the police have no leads. It is up to you solve this mystery. Solve each of the following multiple choice questions using your knowledge of straight line motion. Use the space to the right of or just below each problem to show your work. The correct answers will reveal the details of this heinous crime.

**Who was the murderer?**

**1.)** A particle is moving along the $x$ axis and its position is given by $s(t) = t^3 - 6t^2 + 3t - 1$. Find the acceleration of the particle at $t = 2$.

**(A)** $-11$ **The Hulk**
**(B)** $-9$ **Iron Man**
**(C)** $-1$ **Ant Man**
**(D)** $0$ **The Black Widow**

$v(t) = 3t^2 - 12t + 3$

$a(t) = 6t - 12$

$a(2) = 6(2) - 12 = 0$

**Where did the murder take place?**

**2.)** The position of a vehicle moving in a straight line is $s(t) = t^3 - 3t^2 - 6$.
At which time is the particle moving toward the origin?

**(A)** $t = 0$ **On a playground**
**(B)** $t = 1.5$ **At a Dodger's game**
**(C)** $t = 2$ **At Tony Stark's mansion**
**(D)** $t = 3$ **In a library**

(5) (2) $t=3$ vehicle is left of origin and moving right

(1) $s(0) = -6$

$s(1.5) = (1.5)^3 - 3(1.5)^2 - 6 =$ negative

$s(2) = 2^3 - 3(2)^2 - 6 =$ negative

$s(3) = 3^3 - 3(3)^2 - 6 =$ NEGATIVE

(2) vehicle is always left of origin

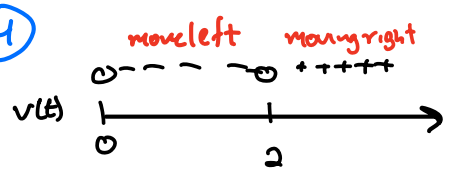
(3) $v(t) = 3t^2 - 6t$

$v(t) = 0$ $\quad 0 = 3t(t-2)$

$t = 0$ and $t = 2$

Stopped Stopped

(4)



**What was the murder weapon?**

**3.)** A bug's position is given by the equation $s(t) = \sin(t) - 3$. Find the average velocity of the bug on the interval $\left[0, \frac{\pi}{2}\right]$.

**(A)** $\frac{2}{\pi}$ **100 kittens propelled from a T-shirt launcher cannon**

**(B)** $0$ **A broken light bulb**

**(C)** $1$ **A styrofoam cup**

**(D)** $\frac{\pi}{2}$ **A pirhana gun**

$= \sin(0) - 3$
$= 0 - 3$
$= -3$

$= \sin\left(\frac{\pi}{2}\right) - 3$
$= 1 - 3$
$= -2$

$$\text{A. velocity} = \frac{s(0) - s\left(\frac{\pi}{2}\right)}{0 - \frac{\pi}{2}} = \frac{-3 - (-2)}{-\frac{\pi}{2}} = \frac{-1}{-\frac{\pi}{2}} = \frac{2}{\pi}$$

**What was the motive of the murder?**

**4.)** The velocity of a particle is $v(t) = t^2 - 11t + 2$. Is the particle speeding up or slowing down at $t = 3$?

**(A)** Slowing down because $a(3) < 0$ **He/she hated Spiderman's costume**

**(B)** Slowing down because $v(3) < 0$ **He/She is a Superman Fan**

**(C)** Speeding up because $a(3) < 0$ and $v(3) < 0$ **He/She thinks spiders are creepy**

**(D)** Speeding up because $a(3) > 0$ **Spiderman called him/her a yellow-bellied coward**

$v(3) = 3^2 - 11(3) + 2 = -22$

$a(t) = 2t - 11$

$a(3) = 2(3) - 11 = -5$

$\therefore a(3) < 0$ and $v(t) < 0$

Special thanks to Bryan Passwater, Speedway High School, Speedway, IN for creating this activity.