

RIDDLE  
AP CALCULUS  
DERIVATIVE APPLICATION PRACTICE

1. A particle moves along the  $x$  - axis so that its position at any time  $t \geq 0$  is given by the function  $x(t) = t^3 - 12t + 1$  where  $x$  is measured in feet and  $t$  is measured in seconds.
- When is the particle moving left?
  - When is the particle speeding up?
  - Find the instantaneous velocity when  $t = 3$  seconds.
  - Find the average velocity during the first 3 seconds
  - Find the acceleration of the particle when  $t = 3$  seconds.
  - At what value or values of  $t$  does the particle change directions?

2. Because it interferes with his view of Venus, Marvin the Martian lands on the moon with the intention of blowing up the Earth. Bugs Bunny, as always, interferes with his plan. Chasing Bugs, Marvin fires a warning shot straight up into the air with his Acme Disintegration Pistol. The height (in feet) after  $t$  seconds of the shot is given by  $s(t) = -2.66t^2 + 135t + 3$ .



- Find the velocity and acceleration as functions of  $t$ . (What is the meaning of the acceleration function?)
- How long will it take for Marvin's shot to reach its maximum height?
- What is the maximum height for Marvin's shot?

3. A farmer builds a fence to enclose a rectangular region along a river (no fence is needed along the river) and to divide the region into two areas by adding a fence perpendicular to the river. She has 600 feet of fencing and wants to enclose the largest possible area. How far from the river should she build that part of the fence that is parallel to the river?
4. A rectangular piece of tin has dimensions 5 in. by 8 in. Four squares are cut out, one at each corner, and the sides are folded up to form an open box. Find the dimensions of the box with the maximum volume.