

**Mini-math Div 3/4: Monday, October 26, 2020 (14 minutes)**

- (1) The motion of a particle is described by the position function

$$s = f(t) = 2t^3 - 13t^2 + 24t, \quad t \geq 0$$

where  $t$  is time measured in seconds and  $s$  is measured in metres.

- (a) When is the particle at rest?
  
  
  
  
  
  
  
  
  
  
- (b) When is the particle moving in the positive direction?
  
  
  
  
  
  
  
  
  
  
- (c) Find the total distance travelled in the first 2 s to 2 decimal places.
  
  
  
  
  
  
  
  
  
  
- (d) Find the acceleration of the particle as a function of time.

(e) When does the particle have 0 acceleration?

(f) What is the particle's acceleration when it is at rest?

(2) The population of a bacteria colony after  $t$  hours is given by

$$n = 2t^3 + 6t^2 + 15t + 2000.$$

Find the rate of change of the population at time  $t$ .

(3) Boyle's Law states that  $PV = k$  where  $P$  is the pressure of a gas,  $V$  is the volume of the gas, and  $k$  is a constant. Find the rate of change of the pressure with respect to the volume.