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1. The position of a particle moving along a coordinate axis is given by $s(t)=t^3-9t^2+24t+4$, where t is time, in seconds.
- (a) Find the velocity of the particle, $v(t)$.
- (b) At what time(s) is the particle at rest?
- (c) On what time intervals is the particle moving from left to right? From right to left?
- (d) When is the item speeding up? When is it slowing down?
- (e) Use the information obtained to sketch the path of the particle along a coordinate axis.
2. The radius of a sphere is increasing at a rate of $2 \text{ cm}/\text{min}$. At what rate is the surface area increasing when the radius is 10 cm?

3. Water is poured into a conical container at the rate of $10 \text{ cm}^3/\text{sec}$. The cone points directly down, and it has a height of 30cm and a base radius of 10cm . How fast is the water level rising when the water is 4cm deep (at its deepest point)?
4. A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s . At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?
5. Let $f(x) = \sqrt{x}$. If $a = 1$ and $dx = \Delta x = \frac{1}{10}$, what are Δy and dy ?
6. Find the differential dy and evaluate dy when $x = \frac{\pi}{4}$ and $dx = -0.1$.

$$y = \tan x$$