

Section 3.11 Related Rates

Air is being pumped into a spherical balloon at the rate of 7 cubic centimeters per second. What is the rate of change of the radius at the instant the volume equals 36π

A ladder 13 feet long is leaning against the side of a building. If the foot of the ladder is pulled away from the building at a constant rate of 2 inches per second, how fast is the angle formed by the ladder and the ground changing (in radians per second) at the instant when the top of the ladder is 12 feet above the ground?

A particle is moving around the ellipse $x^2 + y^2 = 64$. At any time t , its x and y coordinates are given by $x(t) = 4 \cos t$ and $y(t) = 2 \sin t$. At what rate is the particles distance to the point $(2,0)$ changing at any time t ? At what rate is the distance changing when $t = \frac{\pi}{4}$

The amount of computational time in seconds it takes to multiply two square matrices together using traditional methods is approximately given by the formula $t(n) \approx n^3$, where n is the size of the matrix. About how much longer does it take for a computer to multiply two matrices of size 10 compared to size 1000? Say you begin an experiment where you multiply two matrices beginning with $n = 10$ and double the size of each matrix after each trial. At what point (n) does the change in time of calculation increase by more than 1 hour?

New methods can reduce the time taken to multiply the square matrices to approximately $t(n) \approx n^{2.373}$. Repeat the Calculations for the problem above.