

1. Find the derivative of the function $y = \sqrt{x}e^{x^2}(1+x^2)^8$.
2. The minute hand on a watch is 8 mm long, and the hour hand is 4 mm long. How fast is the distance between the tips of the hands changing at one o'clock?
3. A particle moves along the parabola $y = x^2$ in such a way that its abscissa increases at a steady 10 m / sec. How fast is the angle of inclination θ of the line joining the particle to the origin changing, when $x = 3$ m? Does $d\theta/dt$ have a limit as $x \rightarrow \infty$?
4. Find the absolute extrema of $x^4 - 2x^2 + 2$ over the interval $[-2,3]$.
5.
 - (a) A trucker hands in a ticket at a toll booth, showing that in 2 hr the truck had covered 134 mi on a tollway on which the speed limit is 60 mph. Why is the trucker cited for speeding?
 - (b) Show that for any numbers a, b , $|\cos b - \cos a| \leq |b - a|$.
6. Study the variation of $2 + 2x^2 - x^4$: local extrema, intervals of monotonicity, inflection points, intervals of convexity or concavity.
7. Show that $e^x \geq 1$ for $x \geq 0$, and conclude that $e^x \geq 1 + x + x^2/2$ for $x \geq 0$.