1. (4 points) Use logarithmic differentiation to find \( \frac{dy}{dx} \). Your answer must be all in terms of \( x \).

\[ y = x^{\sec(x^2)} \]
2. (3 points) A particle moves along the x-axis and its position at time $t$ is given by

$$s(t) = \frac{t^4}{12} - \frac{7t^3}{6} + 5t^2 + \frac{8t}{3} + 9$$

At what time(s) is the acceleration of the particle 0?

3. (3 points) A sample of Megnesium decayed to 94% of the original amount after 2 years. What is the half life of Megnesium. (It is ok to leave ln in your answer)