1. (2 points) Evaluate the following integral: \[ \int_0^{\sqrt{\pi}} t \cos(t^2) 3^{\sin(t^2)+1} \, dt. \]

2. (3 points) Carbon-14 has a half-life of 5730 years. Moreover, Carbon-14 decays exponentially. Suppose a fossil is found that has 35% Carbon-14 compared to a living sample. How old is it?
3. (3 points) Evaluate the definite integral:
\[ \int_{\frac{2}{5\sqrt{3}}}^{\frac{3}{5}} \frac{3}{x\sqrt{25x^2 - 1}} \, dx. \]

4. (2 points) Find the derivative of
\[ 9^{\log_4(\arctan(x^2))}. \]

Show all steps.