Derivative:

\[
\frac{\partial}{\partial x}(\exp(-ax)) = -ae^{-ax}
\]
Contour plot:

Root:
\[ a = 0 \]

Property as a real function:
Domain:
\( \mathbb{R} \) (all real numbers)

Periodicity:
periodic in \( x \) with period \( \frac{2\pi}{a} \)

Series expansion at \( x = 0 \):
\[ -a + a^2 x - \frac{a^3}{2} x^2 + \frac{a^4}{6} x^3 - \frac{a^5}{24} x^4 + O(x^5) \]
(Taylor series)

Indefinite integral:
\[ \int -a e^{-ax} \, dx = e^{-ax} + \text{constant} \]