1. The table gives the windchill \( w(s, T) \) as a function of the wind speed \( s \) and the temperature \( T \).

\[
\begin{array}{c|cccc}
 s/T & 30 & 20 & 10 & 0 \\
 \hline
 5 & 27 & 16 & 6 & -5 \\
 10 & 16 & 4 & -9 & -24 \\
 15 & 9 & -5 & -18 & -32 \\
\end{array}
\]

a) Estimate \( w_T(10, 10) \), and \( w_s(10, 10) \).

b) Use linear approximation to estimate \( w(12, 13) \).

2. Find.

a) \( \int \left( 2x^{-3} + 3e^{2x} - \ln(2) \right) dx \)

b) \( \frac{d^2}{dx^2} \left( x^3 \ln(x) + e^{3x+7} \right) \)

c) \( \frac{\partial}{\partial s} \left( (s+t)^2 - 3ts^2 + 6t^2 \right) \)

3. Suppose a bacterial culture initially has 400 cells. The growth rate of the culture is proportional to the population. After 1 hour the population has increased to 900 cells.

a) Write down the equation for the population at time \( t \).

b) What is the population after 10 hours?

4. Find any local minima and maxima of the function \( f(x) = \frac{x}{x^2 + 1} \).

5. The acceleration of a car is \( 2t + 3 \ m/s^2 \) \( t \) second into the motion, and the initial velocity is \(-4 \ m/s\).

a) Find the velocity at time \( t \).

b) Find the distance traveled by the car in the first 3 seconds.