WORKSHEET: FINDING THE ABSOLUTE MINIMUM AND MAXIMUM 1

Names and student IDs: _____

Recall the method for maximizing and minimizing a continuous function f on a closed interval $[a, b]$:

(1) Find all the critical numbers c of f in $[a, b]$, that is, numbers c in $[a, b]$ such that $f'(c) = 0$ or $f'(c)$ does not exist.
(2) Evaluate f (**not** f'!) at all the numbers c found in (1) and at the endpoints a and b.
(3) The absolute maximum of f on $[a, b]$ is the largest value you got in (2). It occurs at the value of x you used to produce it. (In rare cases, the absolute maximum can occur at more than one value of x.) Similarly, the absolute minimum of f on $[a, b]$ is the smallest value you got in (2), etc.

Let $h(x) = e^{x/2}\left(164 - 73x + 7x^2\right)$. Use the methods of calculus to find the exact values of x (*not* calculator approximations) at which h has its maximum and minimum values on the interval $[-1, 5]$.

You don't yet know how to find $h'(x)$. So here it is: $h'(x) = \frac{1}{2}(7x - 3)(x - 6)e^{x/2}$.

Also, the problem does not ask you to find the exact maximum and minimum values of h on the interval, only the exact values of x at which they occur.

1. Find all critical numbers of h. (Since h' is already factored, this is easy.)

2. Which critical numbers are in $[-1, 5]$?

3. List the values of x at which one should evaluate h according to Step (2) at the top of the page.

4. Presumably using a calculator, evaluate h at each of the numbers just found. (Do **not** evaluate h' at those numbers! But **do** explain why it is not helpful to do that.)

5. Where does h take its absolute minimum and maximum values on $[-1, 5]$?

Date: 18 April 2025.