4. [12 points] The **continuous** function $w(t)$ is given by the piecewise formula below. Also given is a partial formula for its derivative $w'(t)$. In case it is helpful, recall that $e \approx 2.7$.

$$w(t) = \begin{cases} 3e^t & t \leq 0 \\ \\ \dfrac{1}{3}\,t^3 - 2t^2 + 3t + 3 & t > 0 \end{cases} \qquad w'(t) = \begin{cases} 3e^t & t < 0 \\ ?? & t = 0 \\ (t-1)(t-3) & t > 0 \end{cases}$$

For parts **a**., **c**., and **d**. below, you must use calculus to find and **justify** your answers. Make sure your final conclusions are clear, and that you show enough evidence to justify those conclusions.

a. [2 points] Find $w'(0)$, or write DNE if it does not exist. Show your work or explain.

Answer: $w'(0) =$ _____

b. [2 points] Find all critical points of $w(t)$, or write NONE if there are none. (*No justification required.*)

Answer: Critical point(s) at $t =$ _____

c. [4 points] Find the t-coordinates of all global minimum(s) and global maximum(s) of $w(t)$ **on the interval $[-1, 3]$**. If there are none of a particular type, write NONE.

Answer: Global min(s) at $t =$ _____

Answer: Global max(es) at $t =$ _____

d. [4 points] Find the t-coordinates of all global minimum(s) and global maximum(s) of $w(t)$ **on the interval $(-\infty, \infty)$**. If there are none of a particular type, write NONE.

Answer: Global min(s) at $t =$ _____

Answer: Global max(es) at $t =$ _____