Analysis of $x \mapsto \left(x^2 + 2\,x\right)\ e^x$

We consider the function defined by $f(x) = \left(x^2 + 2\,x\right)\ e^x$.

Its domain of definition is $\mathbb{R}$.

It is derivable on $\mathbb{R}$.

Its derivative is $f'(x) = \left(x^2 + 4\,x + 2\right)\ e^x$.

It admits the below limits:

$$\lim_{x \to -\infty} f(x) = 0$$

$$\lim_{x \to +\infty} f(x) = +\infty$$

The equation of its horizontal asymptote is:

$$y = 0$$

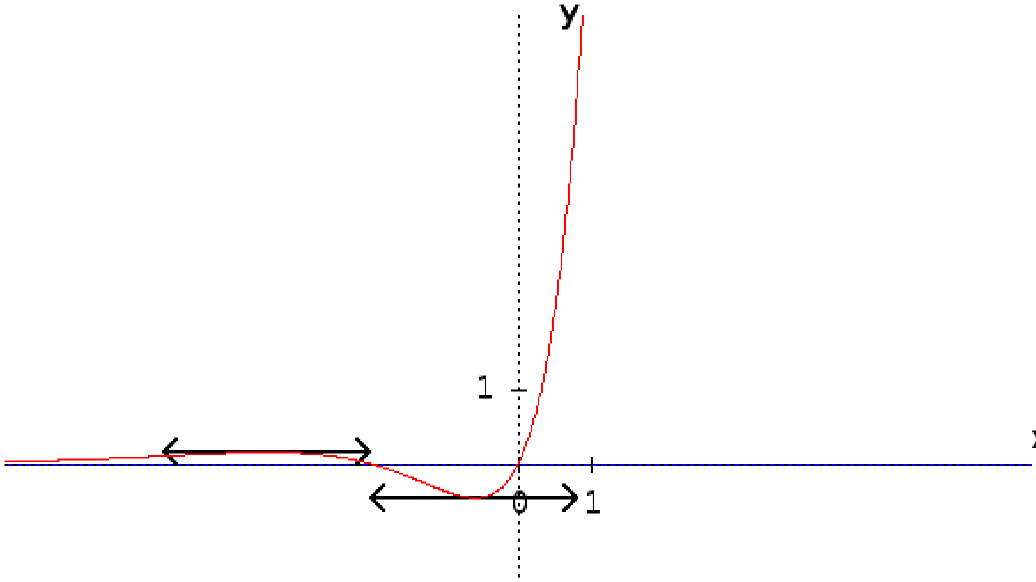
A table of values is:

x	$-\sqrt{2} - 2 \approx -3.41$	$\sqrt{2} - 2 \approx -0.585$
$f(x)$	$2^{\frac{3}{2}} \cdot e^{-\sqrt{2}-2} + 2 \cdot e^{-\sqrt{2}-2} \approx 0.158$	$2 \cdot e^{\sqrt{2}-2} - 2^{\frac{3}{2}} \cdot e^{\sqrt{2}-2} \approx -0.461$

Its table of variations is:

x	$-\infty$		$-\sqrt{2} - 2$		$\sqrt{2} - 2$		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	0	$\nearrow$	$2^{\frac{3}{2}} \cdot e^{-\sqrt{2}-2} + 2 \cdot e^{-\sqrt{2}-2}$	$\searrow$	$2 \cdot e^{\sqrt{2}-2} - 2^{\frac{3}{2}} \cdot e^{\sqrt{2}-2}$	$\nearrow$	$+\infty$

Its graph is:



Note: these results have been obtained from an automated program and are not guaranteed to be exact.