Quiz 4

Find the absolute maximum and absolute minimum values of $f(x) = xe^{x^2-3x}$ on the interval $[0,2]$ if they exist.

Solution

f can take its max. and min. values at critical points, or singular points, or end points.

$$f'(x) = 1 \cdot e^{x^2-3x} + x e^{x^2-3x}(2x-3)$$
$$= e^{x^2-3x}(2x^2-3x+1)$$

$$f'(x) = 0 \Longrightarrow x = \frac{1}{2}, 1 \in [0,2]$$

So, at $x = \frac{1}{2}$, $x = 1$, f has critical points.

Since f is differentiable on $[0,2]$, f has no singular points on $[0,2]$.

$$x = \frac{1}{2} \Rightarrow f\left(\frac{1}{2}\right) = \frac{1}{2}e^{-5/4}$$

$$x = 1 \Rightarrow f(1) = e^{-2}$$

For the endpoints, $x = 0 \Rightarrow f(0) = 0$

$$x = 2 \Rightarrow f(2) = 2e^{-2}$$

Thus, abs. min. value of f on $[0,2]$ is $f(0) = 0$

abs. max. value of f on $[0,2]$ is $f(2) = 2e^{-2}$