

$$* y = x^2 \cdot e^{-x}$$

1.) Intercepts $x=0 \rightarrow (0,0)$
 $y=0 \rightarrow \frac{x^2}{0} \cdot \frac{e^{-x}}{1} = 0$

2.) Critical Point $\rightarrow f(0)=0$
 $\rightarrow f(2)=2^2 e^{-2} = 4e^{-2}$

$$\frac{dy}{dx} = 2x \cdot \frac{e^{-x}}{1} + x^2 \left(\frac{e^{-x}}{1} \cdot -1 \right)$$

$$e^{-x} (2x - x^2) = 0 \text{ when}$$

$$e^{-x} \neq 0 \quad \underline{x=0} \text{ or } \underline{x=2}$$

3.) Sign Table

$-\infty$	\leftarrow	-1	0	1	2	$\frac{1}{3}$	\rightarrow	∞
			$* e^{-(-1)}(-2-1) = -3e$		$+$		$* e^{-3}(6-9) = \frac{1}{e^3} \cdot (-3) = -\frac{3}{e^3}$	
			\downarrow		\uparrow		\downarrow	
			min		max			
				$* \frac{1}{e}(2-1) = \frac{1}{e}$				

4.) Second Derivative test

$$\frac{d^2y}{dx^2} = -e^{-x}(2x-x^2) + e^{-x}(2-2x)$$

$$e^{-x}(-2x+x^2+2-2x)$$

$$1(0+0+2-0) = \underline{\underline{+2}} \quad \text{At } x=0 \text{ local min}$$

$$e^{-2}(-2 \cdot 2 + 2^2 + 2 - 2 \cdot 2) = -2e^{-2}, \quad \frac{-2}{e^2} = \underline{\underline{-0.27}} \quad \text{At } x=2 \text{ local max}$$

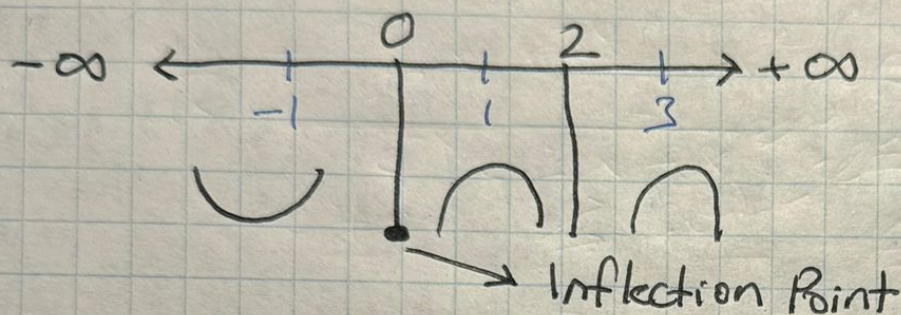
5.) Sign Table

5) Second Time Table (Concavity, inflection p.)

$$\frac{d^2 y}{dx^2} = e^{-x} (2x + x^2 + 2 - 2x) * e^{-(1)} (-1^2 - 4(-1) + 2) = \underline{\underline{7e > 0}}$$

$$= e^{-x} (x^2 - 4x + 2) * \frac{1}{e} (1^2 - 4 + 2) = -\frac{1}{e} < 0$$

$$* \frac{1}{e^3} (3^2 - 12 + 2) = -\frac{1}{e^3} < 0$$



6) Horizontal Asymptotes

$$* \lim_{x \rightarrow \infty} x^2 e^{-x} = \lim_{x \rightarrow \infty} \frac{x^2 \rightarrow \text{slower}}{e^x \rightarrow \text{faster}} = \underline{\underline{0}}$$

$$\lim_{x \rightarrow \infty} \frac{2x}{e^x} = \frac{\frac{d}{dx} 2x}{\frac{d}{dx} e^x} = \frac{2}{e^x} = \underline{\underline{0}}$$

Horizontal Asymptote at x=0

$$* \lim_{x \rightarrow -\infty} \frac{\frac{d}{dx} x^2}{\frac{d}{dx} e^x} \rightarrow \frac{\frac{d}{dx} 2x}{\frac{d}{dx} e^x} \rightarrow \frac{2}{e^x \rightarrow 0} = \underline{\underline{+\infty}}$$

7) Vertical Asymptote no possible discontinuity

Norre

8) Graph

