Exp) Determine where the f. is increase/decrease, concave up/down, PoI for $f(x) = \frac{1}{\sqrt{2\pi}} \cdot e^{-x^2/2}$ $\qquad (e^u)' = u' \cdot e^u$

local max at $x = ?$ a) $x=-1$ b) 0 c) 1 c) None

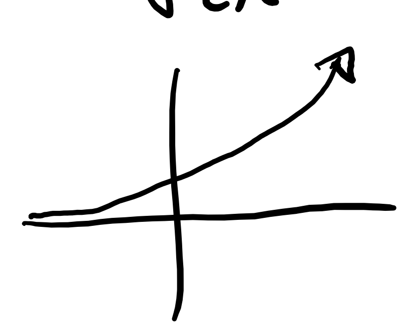
$$f'(x) = \frac{1}{\sqrt{2\pi}} \cdot \left(-\frac{x^2}{2}\right)' \cdot e^{-x^2/2} = \frac{1}{\sqrt{2\pi}} \cdot \left(\frac{-\cancel{2}x}{\cancel{2}}\right) \cdot e^{-x^2/2}$$

$$= \frac{-x}{\sqrt{2\pi}} \cdot e^{-x^2/2} = \frac{-x}{\sqrt{2\pi} \cdot e^{x^2/2}} \begin{array}{l} \to 0 \\ \to \cancel{\text{DNE}} \text{ none} \end{array}$$

critical P. $f'(x) = 0$ or DNE

$-x = 0 \Rightarrow x = 0$

sign chart for $f'(x) = \frac{-x}{\sqrt{2\pi}} \boxed{e^{-x^2/2}}$



	$-\infty$	-2	0	2	∞
f'		+		−	
f		increasing $(-\infty, 0)$	local max	decreasing $(0, \infty)$	

Local max at $x=0$, $f(0) = \frac{1}{\sqrt{2\pi}} \cdot e^0 = \frac{1}{\sqrt{2\pi}}$

There's no local min.

$$f'(x) = \frac{-x}{\sqrt{2\pi}} \cdot e^{-x^2/2} \Rightarrow f''(x) = -1 \cdot \frac{e^{-x^2/2}}{\sqrt{2\pi}} + \frac{+x}{\sqrt{2\pi}} \cdot (+x) \cdot e^{-x^2/2}$$

$$\left(e^{-x^2/2}\right)' = e^{-x^2/2} \cdot \left(\frac{-2x}{2}\right) = e^{-x^2/2} \cdot (-x)$$

$$f''(x) = -\frac{e^{-x^2/2}}{\sqrt{2\pi}} + \frac{x^2}{\sqrt{2\pi}} \cdot e^{-x^2/2} = \boxed{\frac{e^{-x^2/2}}{\sqrt{2\pi}} \overset{+}{} \left(-1 + x^2\right)}$$

$$x^2 - 1$$

$$\underbrace{(x-1)(x+1)}_{0}$$

$f''(x) = 0$ or DNE $\rightarrow$ 2nd order critical P.

$x = 1, \; x = -1$

$$f''(-2) = \frac{e^{-4/2}}{\sqrt{2\pi}} \cdot (4-1) > 0$$

$f''(0) < 0, \; f''(2) > 0$

PoI are $x = -1, 1$

sign chart for $f''(x)$