SECTION [4.4]

(34) $y = e^{-(x-a)^2/b}$ $\quad b > 0$, LOCAL MAX AT $x = 2$

POI AT $x = 1$ AND $x = 3$

$$y = e^{\frac{-(x-a)^2}{b}}$$

$$y' = e^{\frac{-(x-a)^2}{b}} \cdot \left[\frac{-2(x-a)}{b}\right] = 0$$

$$\frac{-2(x-a)}{b} = 0$$

$$-2x + 2a = 0$$

$$x = a \quad \text{MAX}$$

y': $+$ at $\frac{1}{2}a$, 0 at a, $-$ at $2a$

max occurs at $x = 2$ $\quad \therefore a = 2$

$$y' = e^{\frac{-(x-2)^2}{b}} \left[\frac{-2(x-2)}{b}\right]$$

$$y'' = e^{-\frac{(x-2)^2}{b}} \cdot \left[\frac{-2(x-2)}{b}\right] \cdot \left[\frac{-2(x-2)}{b}\right] + e^{\frac{-(x-2)^2}{b}}\left(-\frac{2}{b}\right)$$

$$y'' = e^{-\frac{(x-2)^2}{b}} \left[\left[\frac{-2(x-2)}{b}\right]^2 - \frac{2}{b}\right] = 0$$

let $x = 1$ $\quad \left(-\frac{2}{b}(x-2)\right)^2 = \frac{2}{b}$

$$\left(-\frac{2}{b}(-1)\right)^2 = \frac{2}{b}$$

$$\frac{4}{b^2} = \frac{2}{b}$$

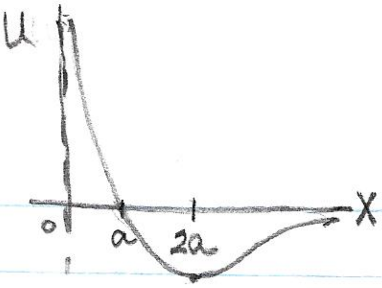
$$2b^2 = 4b$$

$$2b = 4$$

$$b = 2$$

$$\boxed{y = e^{-\frac{(x-2)^2}{b}}}$$

(c)



(52) $U = b\left(\frac{a^2}{x^2} - \frac{a}{x}\right) \qquad x > 0$

(a) $U = b(a^2x^{-2} - ax^{-1}) = bax^{-2}(a - x) = 0$

$x = a$ is x-intercept

(b) $\frac{dU}{dx} = b(-2a^2x^{-3} + ax^{-2})$

$abx^{-3}(-2a + x) = 0$

$x = 2a$ L. MIN $\Rightarrow$ U' $\left.\right\}$ $-$ at a, 0 at $2a$, $+$ at $3a$

THERE IS NO LOCAL MAXIMUM.

(a) $\lim\limits_{x \to \infty} \frac{a^2b - abx}{x^2}$

$\lim\limits_{x \to \infty} \left(\frac{a^2b}{x^2} - \frac{ab}{x}\right) = 0$ $\therefore$ $Y = 0$ IS THE HORIZONTAL ASYMPTOTE

$\frac{a^2b}{x^2} \searrow 0$, $\frac{ab}{x} \searrow 0$

Also as $x \to \infty$, $\frac{a^2b}{x^2} < \frac{ab}{x}$, therefore the graph of U approaches this horizontal asymptote from below the x-axis.