6. If $y = e^{\frac{1}{x^2}} + \frac{1}{e^{x^2}}$, then find $\frac{dy}{dx}$

$y = e^{x^{-2}} + e^{-x^2}$

$$y' = \frac{-2}{x^3} e^{x^{-2}} - 2x e^{-x^2}$$

7 Let $f(x) = xe^{\frac{x}{2}}$. Where is $f(x)$ increasing, decreasing, concave up, and concave down? Find the local maxima, local minima, and points of inflection of $y = f(x)$. Find all vertical and horizontal asymptotes of $y = f(x)$. Graph $y = f(x)$.

$f'(x) = \frac{x}{2} e^{\frac{x}{2}} + e^{\frac{x}{2}} = \frac{1}{2} e^{\frac{x}{2}} (x+2)$

$f''(x) = \frac{1}{2} e^{\frac{x}{2}} + \frac{1}{4} e^{\frac{x}{2}} (x+2)$

$= \frac{1}{4} e^{\frac{x}{2}} (x+4)$

f' neg | f' pos
-2

f'' neg | f'' pos
-4

No ver asy because $\lim_{x \to c} f(x) \neq \infty$

for any numbers c

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

$\lim_{x \to -\infty} f = 0$ Actually this require L'hopital's rule

$\lim_{x \to -\infty} x = -\infty \quad \lim_{x \to -\infty} e^{\frac{x}{2}} = 0$

These two parts of the problem fight one another

But $e^{\frac{x}{2}}$ wins.

So $y=0$ is a hor. asy

f increases for $-2 \leq x$

f decrs. for $x \leq -2$

f is c.u. for $-4 \leq x$

f is c.d for $x \leq -4$

$(-4, f(-4))$ is a pofi

$(-2, f(-2))$ is a loc. min