9 Oct 2009

44) $\lim\limits_{x \to -\infty} \left(3x + \sqrt{9x^2 - x}\right)$

$$\lim_{x \to -\infty} \frac{9x^2 - (9x^2 - x)}{3x - \sqrt{9x^2 - x}}$$

$$\lim_{x \to -\infty} \frac{x}{3x - \sqrt{9x^2 - x}}$$

$\sqrt{9x^2} = |3x|$

if $x < 0$ $|3x| = -3x$

$$\boxed{\frac{x}{3x - (-3x)}} \leftarrow$$

$$\lim_{x \to -\infty} \frac{x}{3x - \sqrt{9x^2 - x}} = \frac{1}{6}$$

x		-3		-2		0		3	
f''	$+++$	0	$---$	0	$+++$	0	$---$	0	$+++$

f has
rel max at $x = 2$
rel min at $x = 4$, $x = -4$

Inf pt

		-4		2		4	
f'	$-$	0	$+$	0	$-$	0	$+$
f	dec $\cup$		inc	$\cap$	dec	$\cup$	inc

$$y = \frac{2x^2-5x+5}{x-2} = 2x - 1 + \frac{3}{x-2}$$

$$\begin{array}{r|rrr} 2 & 2 & -5 & 5 \\ & & 4 & -2 \\ \hline & 2 & -1 & 3 \end{array}$$

x int none

y int $(0, -5/2)$

VA $x=2$

HA None

SA $y = 2x-1$

Inc $(-\infty, \frac{4-\sqrt{6}}{2}) \cup (\frac{4+\sqrt{6}}{2}, \infty)$ ~~$(-\infty, 2) \cup (2, \infty)$~~

dec $(\frac{4-\sqrt{6}}{2}, 2) \cup (2, \frac{4+\sqrt{6}}{2})$

critical pt $(\frac{4-\sqrt{6}}{2}, f(\frac{4-\sqrt{6}}{2}))$ $(\frac{4+\sqrt{6}}{2}, f(\frac{4+\sqrt{6}}{2}))$ critical

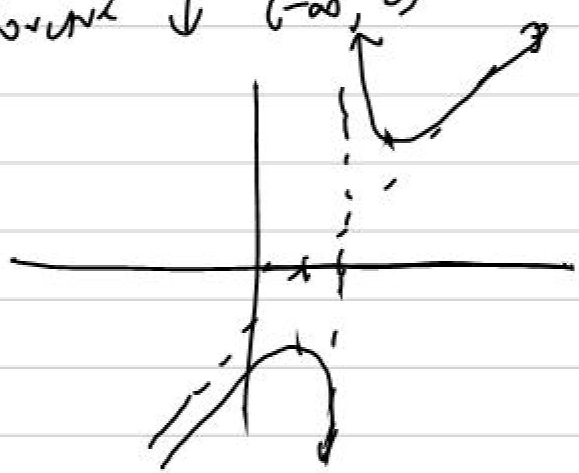
rel max ~~None~~ $(\frac{4-\sqrt{6}}{2}, f(\frac{4-\sqrt{6}}{2}))$

rel min ~~None~~ $(\frac{4+\sqrt{6}}{2}, f(\frac{4+\sqrt{6}}{2}))$

Inf pt None

Concave ↑ $(2, \infty)$

Concave ↓ $(-\infty, 2)$



$$y' = \frac{(4x-5)(x-2) - 1(2x^2-5x+5)}{(x-2)^2}$$

$$y' = \frac{4x^2-13x+10-2x^2+5x-5}{(x-2)^2}$$

$$y' = \frac{2x^2-8x+5}{(x-2)^2}$$

$$\frac{8 \pm \sqrt{24}}{4} \qquad \frac{4 \pm \sqrt{6}}{2}$$

~~$x = \frac{8 \pm \sqrt{64 -}}{}$~~

$$y'' = \frac{\overset{4(x-2)}{(4x-8)}(x-2)^2 - 2(x-2)(2x^2-8x+5)}{(x-2)^2}$$

$$\frac{2(x-2)\left(2(x-2)^2 - (2x^2-8x+5)\right)}{(x-2)^4}$$

$$\frac{2(x-2)(\cancel{2x^2} - \cancel{8x} + 8 - \cancel{2x^2} + \cancel{8x} - 5)}{(x-2)^4}$$

$$\frac{6}{(x-2)^3}$$