10/11

Wednesday, October 11, 2017 10:46 AM

Exam 2 • review at MMC PCA 135 10AM–12PM on Saturday

• online review on Sunday 8-9PM

Review:

$$f(x) = \frac{x^4 - 2x^2}{x^3 - 1}$$

no horizontal asymptote since the degree of num. is larger.

To find the slant/oblique asymptote: long division:

$$\begin{array}{r|l} & x \\ \hline x^3 - 1 & x^4 - 2x^2 \\ & -x^4 + x \\ \hline & -2x^2 + x \end{array}$$

remainder

slant/oblique asym: $\boxed{y = x}$

To find the intersection of the function and

To find the intersection of the function and the asym:

$$f(x) = \frac{x^4 - 2x^2}{x^3 - 1} = y$$

$$\frac{x^4 - 2x^2}{x^3 - 1} = x$$

$$-x \quad -x$$

$$\frac{x^4 - 2x^2}{x^3 - 1} - x \cdot \frac{x^3 - 1}{x^3 - 1} = 0$$

$$\frac{x^4 - 2x^2}{x^3 - 1} - \frac{x(x^3 - 1)}{x^3 - 1} = 0$$

$$\frac{x^4 - 2x^2 - (x^4 - x)}{x^3 - 1} = 0$$

$$\frac{x^4 - 2x^2 - x^4 + x}{x^3 - 1} = 0$$

$$\frac{-2x^2 + x}{x^3 - 1} = 0 \longrightarrow -2x^2 + x = 0$$

$$x(-2x + 1) = 0$$

$$\boxed{x = 0} \qquad -2x + 1 = 0$$

$$-2x = -1$$

$$\boxed{x = \tfrac{1}{2}}$$

# Section 3.6 cont.

Ex: Solve: $2x^2 \le -6x-1$

$+6x+1 \quad +6x+1$

$2x^2+6x+1 \le 0$

① Solve: $2x^2+6x+1=0$

$$x = \frac{-6 \pm \sqrt{36-4\cdot 2\cdot 1}}{2\cdot 2} = \frac{-6 \pm \sqrt{36-8}}{4}$$

$$= \frac{-6 \pm \sqrt{28}}{4} = \frac{-6 \pm 2\sqrt{7}}{4} = \frac{\cancel{2}(-3 \pm \sqrt{7})}{\cancel{4}\,2}$$

$$= \frac{-3}{2} \pm \frac{\sqrt{7}}{2} \quad \frac{-3+\sqrt{7}}{2}, \quad \frac{-3-\sqrt{7}}{2}$$

$\left(-\infty, \frac{-3-\sqrt{7}}{2}\right]$ $\left[\frac{-3-\sqrt{7}}{2}, \frac{-3+\sqrt{7}}{2}\right]$ $\left[\frac{-3+\sqrt{7}}{2}, \infty\right)$

$\frac{-3-\sqrt{7}}{2}$ $\frac{-3+\sqrt{7}}{2}$

$2x^2+6x+1$

| $f$ | $\left(-\infty, \frac{-3-\sqrt{7}}{2}\right]$ | $\left[\frac{-3-\sqrt{7}}{2}, \frac{-3+\sqrt{7}}{2}\right]$ | $\left[\frac{-3+\sqrt{7}}{2}, \infty\right)$ |
|---|---|---|---|
| test pt | $-10$ | $-2, -1$ | $0$ |
| sign of $f(x)$ | $2(100)-60+1$ <br> $+$ | $2(4)-12+1$ <br> $-$ | $0+0+1$ <br> $+$ |

f(x) | + | | −

$$f(x) \le 0$$

$$\boxed{\text{Solution: } \left[\frac{-3-\sqrt{7}}{2}, \frac{-3+\sqrt{7}}{2}\right]}$$

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Ex: Solve: $\dfrac{x+1}{x+3} \ge 2$

$-2 \quad -2$

get 0 to one side

$$\frac{x+1}{x+3} - 2\cdot\frac{x+3}{x+3} \ge 0$$

$$\frac{x+1-2(x+3)}{x+3} \ge 0$$

$$\frac{x+1-2x-6}{x+3} \ge 0$$

$$\frac{-x-5}{x+3} \ge 0$$

Make the sign chart:

$-x-5=0$

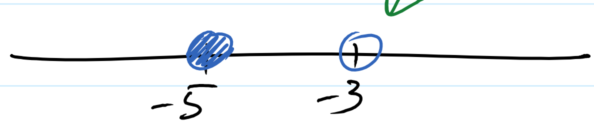
$-x=5$

$x=-5$

$x+3=0$

$x=-3$

-3 is not in the domain



| | $(-\infty,-5]$ | $[-5,-3)$ | $(-3,\infty)$ |
|---|---|---|---|
| test pt | $-6$ | $-4$ | $0$ |

$-(0)-5=-5$

| test pt | $-6$ | $-4$ | $0$ |
| --- | --- | --- | --- |
| $-x-5$ | $+$ | $-$ | $-$ |
| $x+3$ | $-$ | $-$ | $+$ |
| sign of $f(x)$ | $-$ | $+$ | $-$ |

$-(0)-5=-5$

$f(x)\geq 0$, solution: $\boxed{[-5,-3)}$

Ex: Find the domain of

$$g(x)=\sqrt{\frac{x}{2x-1}-1}$$

the inside of a sqrt has to be nonnegative

need to solve:

$$\frac{x}{2x-1}-1\geq 0$$

$$\frac{x}{2x-1}-\frac{1(2x-1)}{2x-1}\geq 0$$

$$\frac{x-(2x-1)}{2x-1}\geq 0$$

$$\frac{-x+1}{2x-1}\geq 0$$

$-x+1=0$

$-x=-1$

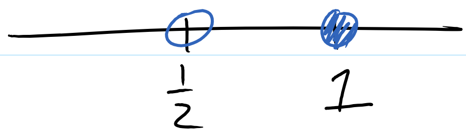
$x=1$

$2x-1=0$

$x=\frac{1}{2}$

$2x-1=0$

$x=\frac{1}{2}$




| f | $(-\infty, \frac{1}{2})$ | $(\frac{1}{2}, 1]$ | $[1, \infty)$ |
|---|---|---|---|
| test pt | 0 | 0.7 | 2 |
| $2x-1$ | $-$ | $+$ | $+$ |
| $-x+1$ | $+$ | $+$ | $-$ |
| sign of $f(x)$ | $-$ | $+$ | $-$ |

$$\overbrace{f(x) \geq 0}$$

solution: $\boxed{(\frac{1}{2}, 1]}$