Name: ______________________________ **ID**: ____________________

Clear your desk of everything except pens, pencils and erasers. Show all work clearly and in order. No notes, phones and calculators. You have 10 minutes to finish the test for 10 points.

The one on the back worth two extra points. Maximum of 10 points will be recorded for each quiz.

1. (a) **(2 points) Which of the following is the equation of a horizontal asymptote for the curve**

$$y = \frac{9x-2}{5-2x}$$

$\lim_{x\to\infty} \frac{9x-2}{5-2x} = \frac{9\cancel{x}}{-2\cancel{x}} = \boxed{\frac{9}{-2}}$

$y = -\frac{9}{2}$

A. $x = \frac{9}{2}$; **B.** $y = -\frac{9}{2}$; **C.** $y = 0$; **D.** $y = \frac{5}{2}$; **E.** $x = -\frac{5}{2}$

(b) **(2 points) Which of the following is the equation of a vertical asymptote for the curve**

$$y = \frac{9x-2}{5-2x}$$

$5-2x=0 \Rightarrow x=\frac{5}{2}$

A. $y = \frac{5}{2}$; **B.** $y = -\frac{9}{2}$; **C.** $x = 0$; **D.** $x = \frac{5}{2}$; **E.** $x = -\frac{5}{2}$

2. (a) **(4 points) Find all asymptotes of**

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

Horizontal: $\lim_{x\to\infty} \frac{x^2}{x^2-4} = \frac{x^2}{x^2} = 1$. $y=1$.

Vertical: $x^2-2=0 \Rightarrow (x+2)(x-2)=0 \Rightarrow x=2$ and $x=-2$

(b) **(2 points) Give that** $f'(x) = \frac{8x}{(x^2-4)^2}$. **Find all the critical numbers of** $f(x)$.

$f'(x)=0$ or $f'(x)$ D.N.E.

$8x=0$

$x=0$

$x^2-4=0$.

$x=\pm 2$.

Critical points: $x=0$, $x=2$, $x=-2$.

(★ Finish the problems on the front page first. No more than 10 points may be earned on the quiz. The extra problem is of average (or above) actual exam difficulty level. It is recommended to do it now or later to check whether you handle the materials well enough for the exam.)

[2 extra points] Continue with the function

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

Suppose we know the following information for $f(x)$. Which picture below best fits the graph of $y = f(x)$.

I $f(x)$ **is continuous on** $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$ **and is discotinuous at** $x = 2$ **and** $x = -2$.

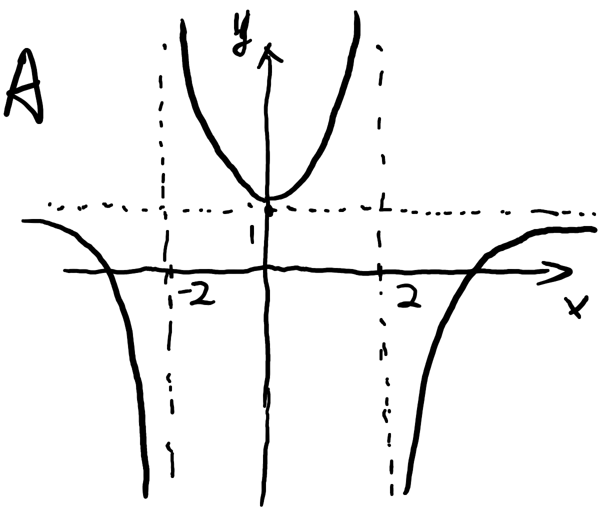
II f **is increasing on** $(-\infty, -2) \cup (-2, 0)$ **and decreasing on** $\cup(0, 2) \cup (2, \infty)$.

III $\lim_{x\to\infty} f(x) = \lim_{x\to-\infty} f(x) = 1$;

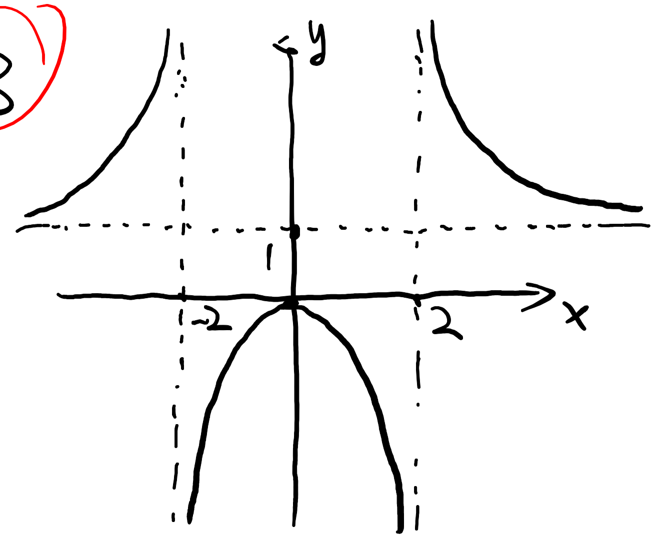
$\lim_{x\to-2^-} f(x) = +\infty$; $\lim_{x\to-2^+} f(x) = -\infty$;

$\lim_{x\to 2^-} f(x) = -\infty$; $\lim_{x\to 2^+} f(x) = +\infty$.

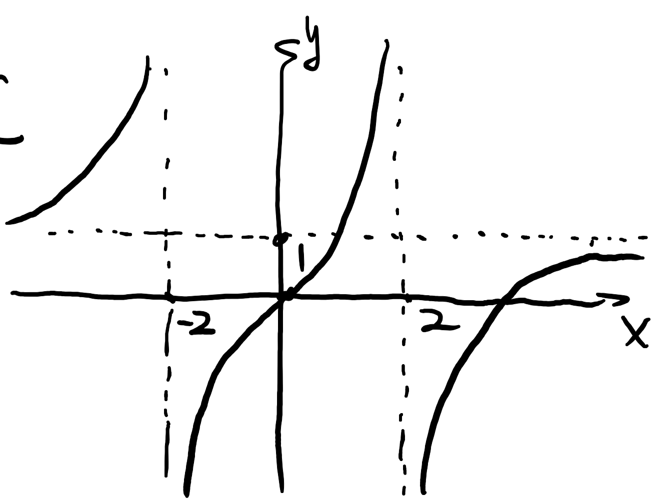
A



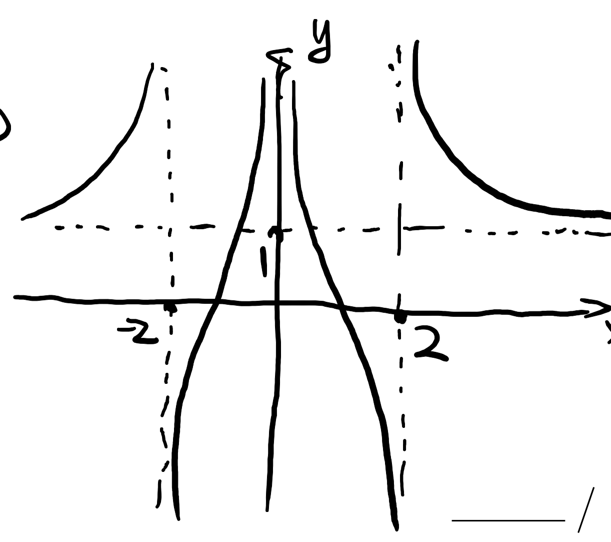
B



C



D



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