

Name: \_\_\_\_\_

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. Evaluate the following limits

(a) (2 points)

$$\lim_{x \rightarrow \infty} \frac{3x + 1}{4x^2 - 2}$$

$$= \lim_{x \rightarrow \infty} \frac{3x}{4x^2} = \lim_{x \rightarrow \infty} \frac{3}{4x} = \frac{3}{\infty} = 0$$

(b) (2 points)

$$\lim_{x \rightarrow \infty} \frac{3x + 1}{\sqrt{4x^2 - 2}}$$

$$= \lim_{x \rightarrow \infty} \frac{3x}{\sqrt{4x^2}} = \lim_{x \rightarrow \infty} \frac{3x}{2x} = \frac{3}{2}$$

(c) (2 points)

$$\lim_{x \rightarrow \infty} \frac{3x + 1}{\sqrt{4x^2 - 2} + x}$$

$$= \lim_{x \rightarrow \infty} \frac{3x}{\sqrt{4x^2} + x} = \lim_{x \rightarrow \infty} \frac{3x}{2x + x} = \frac{3}{3} = 1$$

2. (4 points) Find all the VERTICAL asymptotes of

$$f(x) = \frac{x^3 - 3x + 7}{x^2 - 5x + 6}$$

$$\text{V.A. } x^2 - 5x + 6 = 0$$

$$\Rightarrow (x-2)(x-3) = 0$$

$$\Rightarrow \boxed{x=2} \text{ and } \boxed{x=3}$$

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

I.  $f(0) = 0$ .

II.  $f(x)$  is continuous on  $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$  and is discontinuous at  $x = 2$  and  $x = -2$ .

III.  $f'(x) > 0$  for  $x$  in  $(-\infty, -2) \cup (-2, 0)$  and  $f'(x) < 0$  for  $x$  in  $(0, 2) \cup (2, \infty)$ .

IV.  $\lim_{x \rightarrow \infty} f(x) = 1$ ;  $\lim_{x \rightarrow -\infty} f(x) = 1$ ;

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

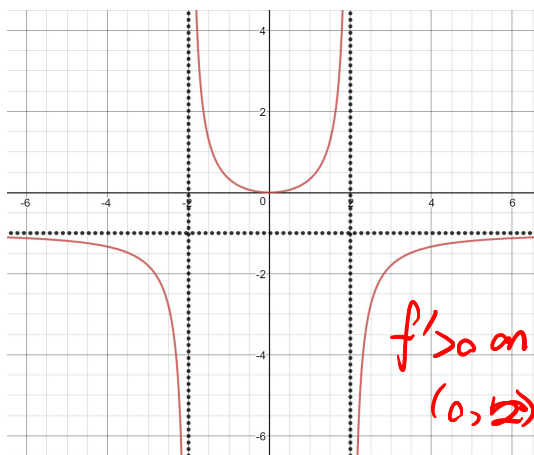


Figure 1: A

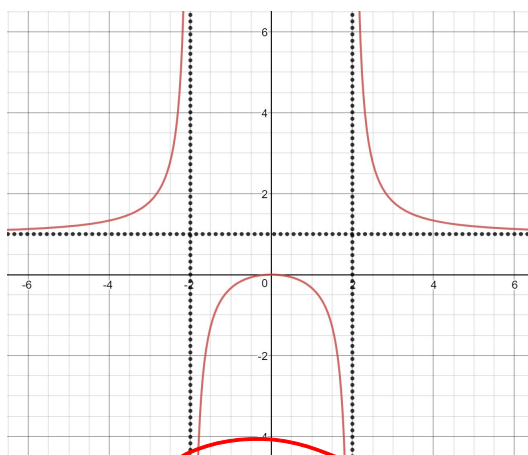


Figure 2: B

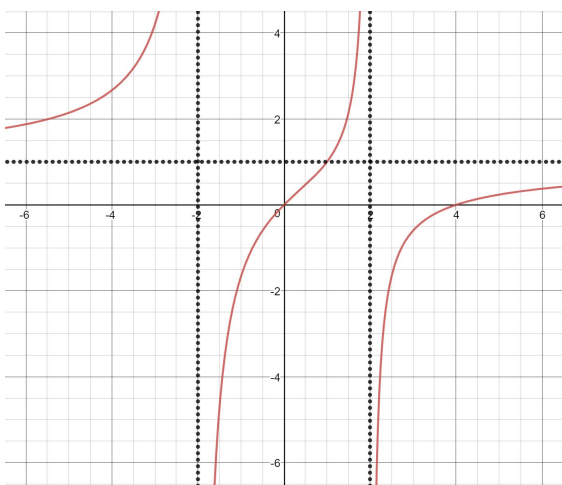


Figure 3: C

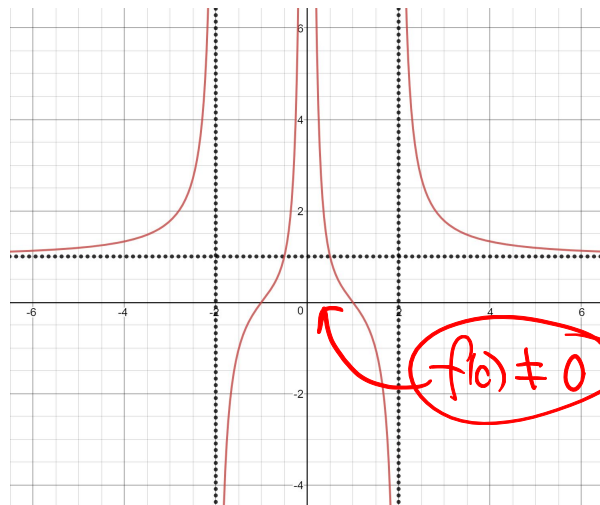


Figure 4: D