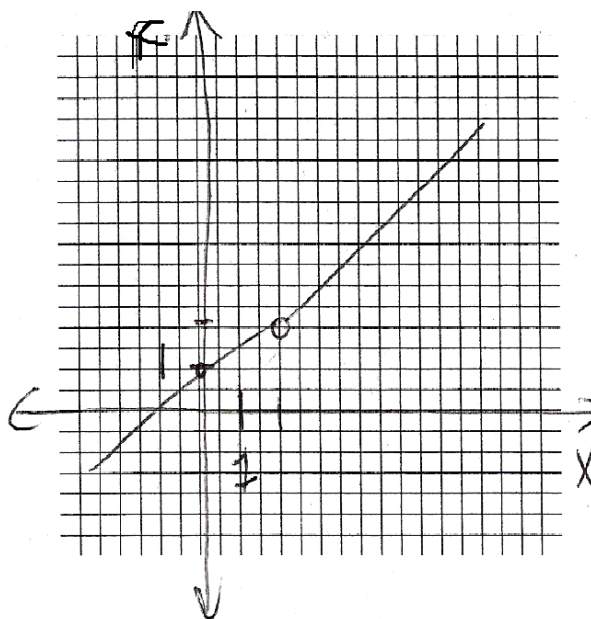


All questions worth 10 points. No work = No credit.

1. Specify the domain of the function  $f(x) = \frac{x^2 - x - 2}{x - 2}$ , and sketch it (be sure to label your axes)

$$x \neq 2$$

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



2. Specify the domain of the function  $f(x) = \frac{1}{x^2 + 1} + \sqrt{x + 3}$

$$x^2 + 1 \neq 0 \checkmark$$

$$x + 3 \geq 0$$

$$\boxed{x \geq -3}$$

3. For the function  $f(x) = 3x^2 + 2x$ ,  $g(x) = \sqrt{x + 1}$ , find  $f \circ g(x)$  and  $g \circ f(x)$  and their domains

$$f \circ g = f(\sqrt{x+1}) = 3(x+1) + 2\sqrt{x+1} = 2\sqrt{x+1} + 3x + 3$$

$$D: x \geq -1$$

$$g \circ f = g(3x^2 + 2x) = \sqrt{3x^2 + 2x + 1} \quad \left\{ \begin{array}{l} -2 \pm \sqrt{4 - 4(3)(1)} \\ 2(3) \end{array} \right. \text{pos } \forall x$$

$$D: \text{all } \mathbb{R}$$

4. When is the function  $\frac{\sin(x)}{\cos\left(\frac{x}{2}\right)}$  equal to zero? When is it undefined?

zero:  $x = 0, \pm \pi, \pm 2\pi, \pm 3\pi, \pm 4\pi, \dots$

und:  $\frac{x}{2} = \pm \frac{\pi}{2}, \pm \frac{3\pi}{2}, \dots$

$x = \pm \pi, \pm 3\pi, \pm 5\pi, \dots$

5. Find  $\lim_{x \rightarrow 5} \frac{x^2 - 2x - 15}{x - 5}$

$$= \lim_{x \rightarrow 5} \frac{(x-5)(x+3)}{x-5} = \lim_{x \rightarrow 5} x+3 = 8$$

6. Find  $\lim_{x \rightarrow 0} \frac{\sqrt{x+16} - 4}{x}$

$$= \lim_{x \rightarrow 0} \frac{(x+16) - 16}{x(\sqrt{x+16} + 4)} = \lim_{x \rightarrow 0} \frac{x}{x(\sqrt{x+16} + 4)}$$

$$= \lim_{x \rightarrow 0} \frac{1}{\sqrt{x+16} + 4} = \frac{1}{\sqrt{16} + 4} = \frac{1}{8}$$

7. Find  $\lim_{x \rightarrow 2} \frac{x^2 + 4x - 12}{|x - 2|}$  by evaluating the limit from the right and left

$$\lim_{x \rightarrow 2^+} \frac{(x-2)(x+6)}{+(x-2)} = \lim_{x \rightarrow 2^+} x+6 = 8$$

$$\lim_{x \rightarrow 2^-} \frac{(x-2)(x+6)}{-(x-2)} = \lim_{x \rightarrow 2^-} -(x+6) = -8$$

lim DNE  
 $x \rightarrow 2$   
 because  $\lim_{x \rightarrow 2^+} \neq \lim_{x \rightarrow 2^-}$

8. Find  $\lim_{x \rightarrow \infty} \frac{x^2 + 2x^3 + 7x}{3x + x^3 + 17x^2}$  and  $\lim_{x \rightarrow -\infty} \frac{x^2 + 2x^3 + 7x}{3x + x^3 + 17x^2}$

$$\frac{2x^3}{x^3} \rightarrow 2$$

$$\lim_{x \rightarrow \pm \infty} = 2$$

9. Find all asymptotes (horizontal and vertical) for  $f(x) = \frac{(x-3)(4+2x)(x+7)}{(x+7)(6-3x)(x+12)}$

VERTICAL: <sup>(hole)</sup> ~~1~~, 2, -12

HORIZ:  $\frac{x \cdot 2x \cdot x}{x \cdot -3x \cdot x} = \frac{2x^3}{-3x^3} \rightarrow -\frac{2}{3}$

10. Sketch a function that has the following (and label)...

- a) a removable discontinuity
- b) an infinite discontinuity
- c) a jump discontinuity
- d) a horizontal asymptote
- e) a vertical asymptote
- f) at least one horizontal tangent

(answers may vary)

