

Sections 2.6 & 2.7 – I.C.E

Part A: For #1 – 4, be sure to use a sign chart to find the appropriate intervals for your solution set:

- 1) Solve $x^2 + x < 6$ and answer using interval notation

$$x^2 + x - 6 < 0$$

$$(x+3)(x-2) < 0$$



We want < 0

$$(-3, 2)$$

- 2) Solve $\frac{-2(x-3)}{x+2} \geq 0$ and answer using interval notation

$$D: \{x \mid x \neq -2\}$$

Critical values: 3, -2



We want ≥ 0

$$[-2, 3]$$

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3) Solve $\frac{x^2+10x+24}{x^2-3x-4} \leq 0$ and answer using interval notation

$$\frac{(x+4)(x+6)}{(x-4)(x+1)} \leq 0$$

$$D: \{x \mid x \neq 4, -1\}$$

Critical values:

$$-6, -4, -1, 4$$



we want ≤ 0

$$[-6, -4] \cup (-1, 4)$$

4) Solve $\frac{4}{x+5} - \frac{1}{2x+3} > 0$ and answer using interval notation

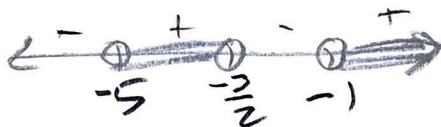
$$\frac{4(2x+3) - 1(x+5)}{(x+5)(2x+3)} > 0$$

$$\frac{8x+12-x-5}{(x+5)(2x+3)} > 0$$

$$\frac{7x+7}{(x+5)(2x+3)} > 0$$

$$\frac{7(x+1)}{(x+5)(2x+3)} > 0$$

$$D: \{x \mid x \neq -5, -\frac{3}{2}\}$$



we want > 0

$$(-5, -\frac{3}{2}) \cup (-1, \infty)$$

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Part B: Find all horizontal, slant, and vertical asymptotes for each function. Be sure to state your answers as equations of lines. Also find all x and y-intercepts and draw a sketch of the graph. Label where the asymptotes and the intercepts are located on your graph.

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

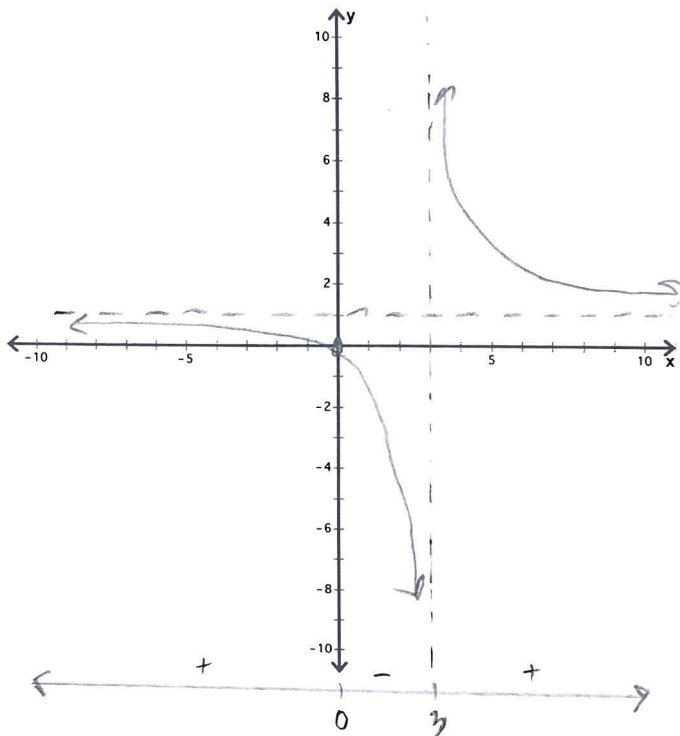
Hole? NO!

VA: $x = 3$

HA or SA: $y = 1$

x-int: $(0, 0)$

y-int: $(0, 0)$



2) $f(x) = \frac{-x^2}{x^2-16} = \frac{-x^2}{(x+4)(x-4)}$

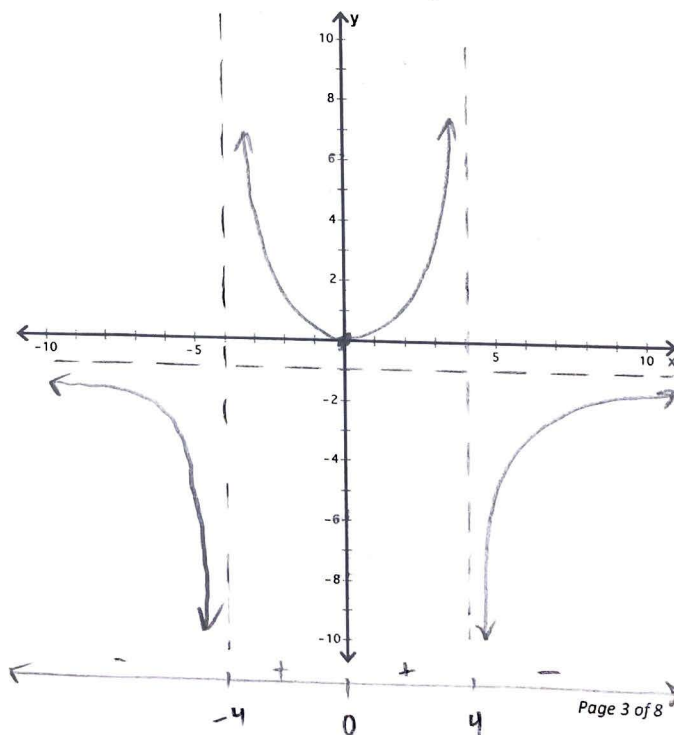
Hole? NO!

VA: $x = 4, x = -4$

HA or SA: $y = -1$

x-int: $(0, 0)$

y-int: $(0, 0)$



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

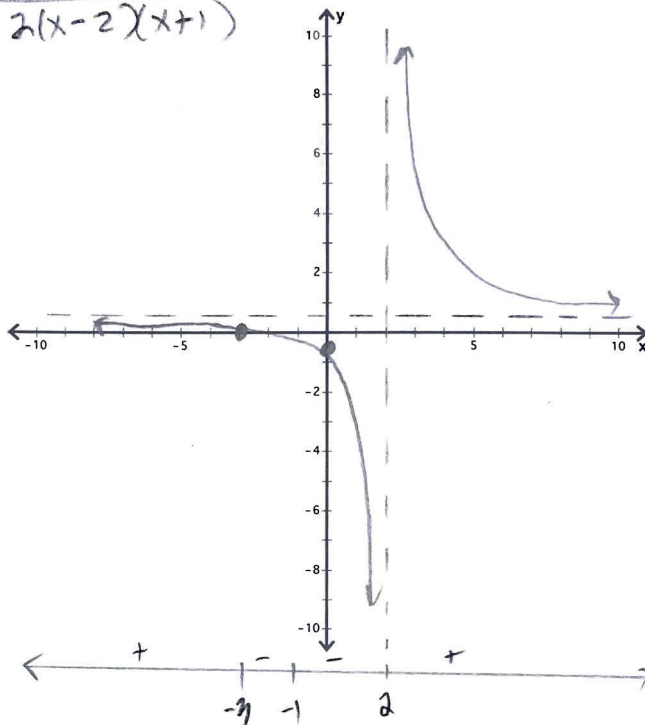
Hole? Yes @ $x = -1$

VA: $x = 2$

HA or SA: $y = \frac{1}{2}$

x-int: $(-3, 0)$

y-int: $(0, -\frac{3}{4})$



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

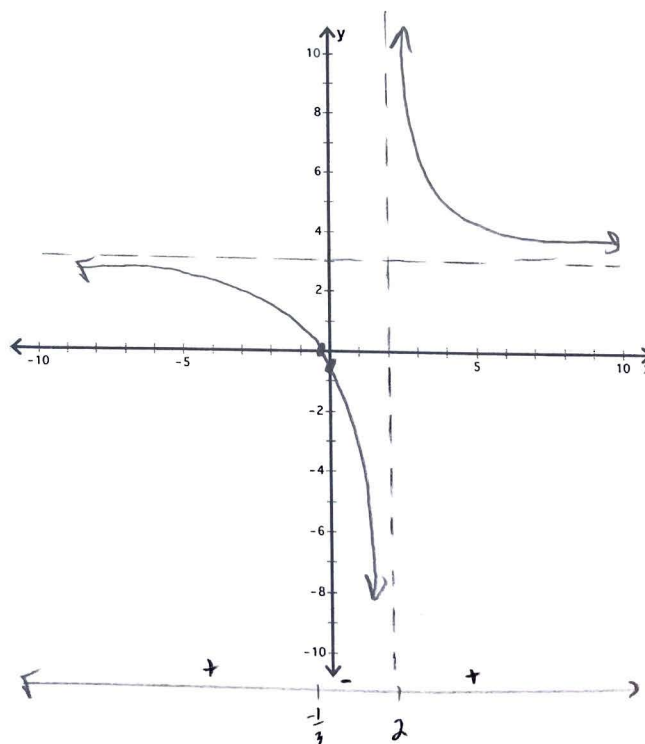
Hole? No!

VA: $x = 2$

HA or SA: $y = 3$

x-int: $(-\frac{1}{3}, 0)$

y-int: $(0, -\frac{1}{2})$



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5) $g(x) = \frac{5}{x^2 - 9} = \frac{5}{(x-3)(x+3)}$

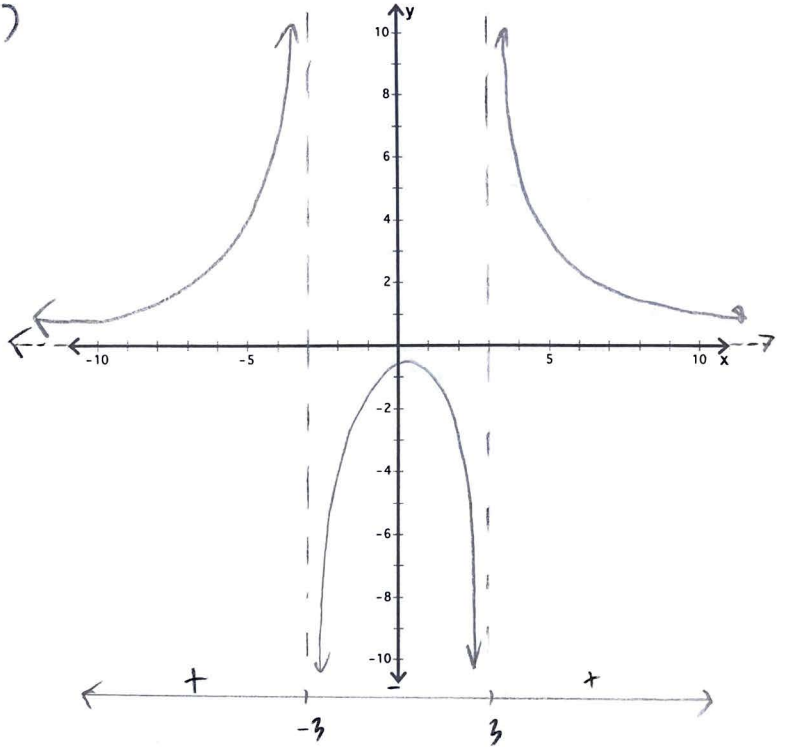
Hole? No!

VA: $x = -3, x = 3$

HA or SA: $y = 0$

x-int: none!

y-int: none!



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

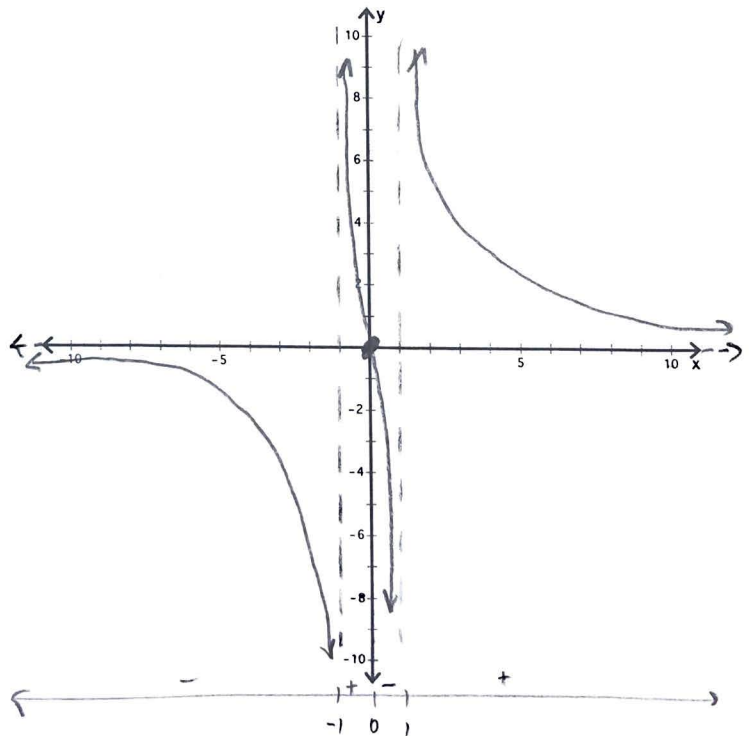
Hole? No!

VA: $x = -1, x = 1$

HA or SA: $y = 0$

x-int: $(0, 0)$

y-int: $(0, 0)$

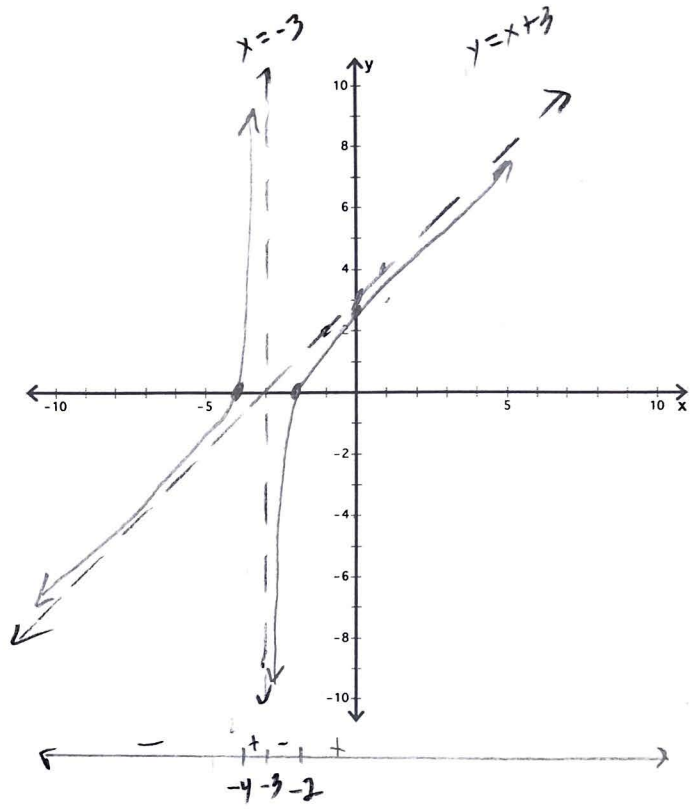


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7) $f(x) = \frac{x^2 + 6x + 8}{x + 3} = \frac{(x+4)(x+2)}{(x+3)}$

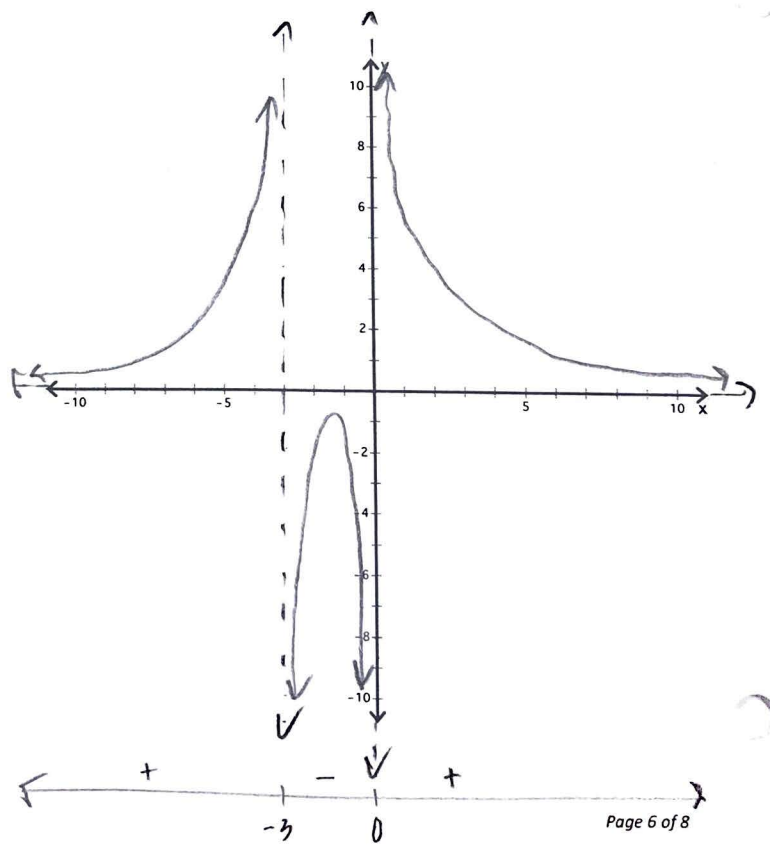
Hole? NO!
 VA: $x = -3$
 HA or SA: $y = x + 3$
 x-int: $(-4, 0), (-2, 0)$
 y-int: $(0, \frac{8}{3})$

$$\begin{array}{r} x+3 \\ x+3 \overline{) x^2 + 6x + 8} \\ \underline{-(x^2 + 3x)} \\ 3x + 8 \\ \underline{-(3x + 9)} \\ -1 \end{array}$$



8) $k(x) = \frac{2}{x^2 + 3x} = \frac{2}{x(x+3)}$

Hole? NO!
 VA: $x = 0, x = -3$
 HA or SA: $y = 0$
 x-int: none!
 y-int: none!



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9) $f(x) = \frac{x^2 + 2x - 12}{x - 5}$ = not factorable
quadratic formula!

$$x - 5 \overline{) \begin{array}{r} x^2 + 2x - 12 \\ -(x^2 - 5x) \\ \hline 7x - 12 \\ -(7x - 35) \\ \hline 23 \end{array}}$$

Hole? NO!

VA: $x = 5$

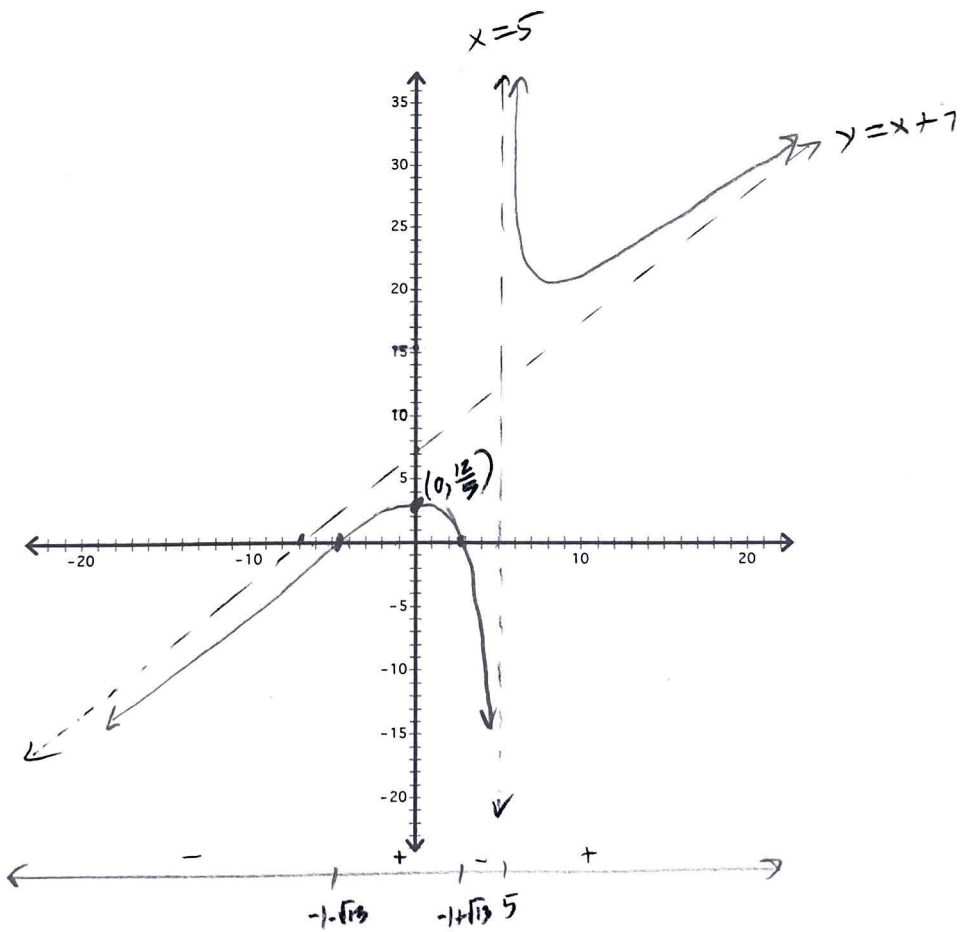
HA or SA: $y = x + 7$

x-int: $(-1 + \sqrt{13}, 0), (-1 - \sqrt{13}, 0)$

y-int: $(0, \frac{12}{5})$

$$x = \frac{-2 \pm \sqrt{4 - 4(1)(-12)}}{2}$$

$$= \frac{-1 \pm \sqrt{52}}{2} = -1 \pm \sqrt{13}$$



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10) $f(x) = \frac{4x^3 - 28x - 24}{x^2 - 3x - 10}$ (hint: try $x + 1$ as a factor for the numerator)

Hole? yes! @ $x = -2$

VA: $x = 5$

HA or SA: $y = 4x + 12$

x-int: $(-1, 0), (3, 0)$

y-int: $(0, \frac{12}{5})$

$$\begin{array}{r|rrrr} -1 & 4 & 0 & -28 & -24 \\ & & -4 & 4 & 24 \\ \hline & 4 & -4 & -24 & 0 \end{array}$$

$$f(x) = \frac{4(x+1)(x^2 - x - 6)}{(x-5)(x+2)} = \frac{4(x+1)(x+2)(x-3)}{(x-5)(x+2)}$$

$$\begin{array}{r} 4x + 12 \\ x^2 - 3x - 10 \overline{) 4x^3 + 0x^2 - 28x - 24} \\ \underline{-(4x^3 - 12x^2 - 40x)} \\ 12x^2 + 12x - 24 \\ \underline{-(12x^2 - 36x - 120)} \\ 48x + 96 \end{array}$$

