1) Complete the following table.
   - ALL VALUES SHOULD BE EXACT!
   - NO ROUGH WORK WILL BE MARKED FOR THIS QUESTION!
   - DO NOT LEAVE ANY BOXES BLANK! WRITE "NONE" IF APPLICABLE.

		$\frac{2x^2+7}{(x-5)(x+2)}$	$\frac{(x+4)(x-3)}{x-2}$	$\frac{(x-3)\cancel{(x+3)}}{\cancel{(x+3)}}$
Function	$y=\frac{(x-3)(x+2)}{(x-1)(x+3)(x-4)}$	$y=\frac{2x^2+7}{x^2-3x-10}$	$y=\frac{x^2+x-12}{x-2}$	$y=\frac{x^2-9}{x+3}$
Domain	$\{x\in\Re \mid x\neq -3,1,4\}$	$\{x\in\Re \mid x\neq -2,5\}$	$\{x\in\Re \mid x\neq 2\}$	$\{x\in\Re \mid x\neq -3\}$
Zeros	$-2,3$	None	$-4,3$	3
***y* – intercept**	$-\frac{1}{2}$	$-\frac{7}{10}$	6	-3
Vertical Asymptotes	$x=-3$ $x=1$ $x=4$	$x=-2$ $x=5$	$x=2$	None
Horizontal Asymptote	$y=0$	$y=2$	None	NONE
Linear Oblique Asymptote	None	None	$y=x+3$	NONE
Holes	NONE	None	None	Where $x=-3$

$$\begin{array}{r|rrr} 2 & 1 & 1 & -12 \\ & & 2 & 6 \\ \hline & 1 & 3 & -6 \end{array}$$

2) Sketch the graph of the function $y = \dfrac{x^2 - 4}{x^2 - 1}$ on the axes below. Be sure to show all work leading to your sketch and clearly show all intercepts and asymptotes on your graph. Don't forget to include scales on the axes.

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

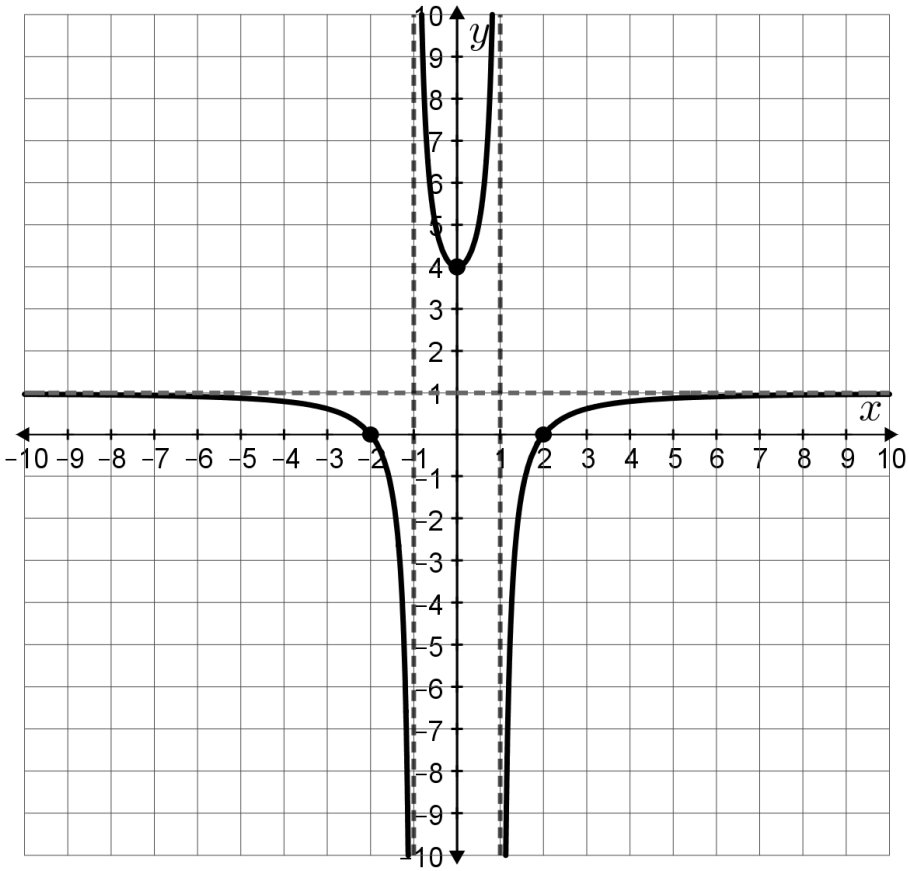
Domain: $\{x \in \mathbb{R} \mid x \neq -1, 1\}$

Intercepts: x-int: $-2, 2$
y-int: 4

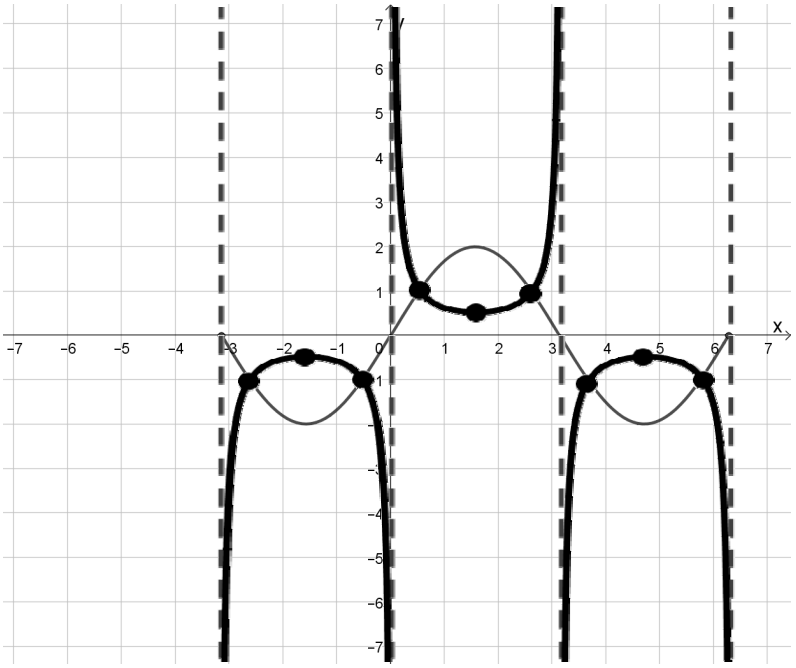
Asymptotes:
Vertical: $x = -1$
$x = 1$
Horizontal: $y = 1$
Oblique: none

Positive/Negative:

Interval	$x < -2$	$-2 < x < -1$	$-1 < x < 1$	$1 < x < 2$	$x > 2$
Sign of y	+	-	+	-	+



3) A section of the graph of a function $y = f(x)$ is shown on the right. Sketch the graph of $y = \dfrac{1}{f(x)}$ on the same interval.



4) Adam purchased a shipment of Casio calculators for \$3082.50. He kept 15 calculators to give as Christmas presents for his closest friends and sold the remaining calculators for \$3751.50, making a profit of \$8.25 on each calculator that he sold. Determine the number of calculators in the original shipment.

Let x represent the number of calculators in the original shipment.

$$\frac{3751.50}{x-15} - \frac{3082.50}{x} = 8.25$$

$$3751.50x - 3082.50(x-15) = 8.25(x-15)(x)$$

$$3751.50x - 3082.50x + 46237.5 = 8.25x^2 - 123.75x$$

$$0 = 8.25x^2 - 792.75x - 46237.5$$

$$x = \frac{792.75 \pm \sqrt{(-792.75)^2 - 4(8.25)(-46237.5)}}{2(8.25)}$$

$x = 137$ or ~~$x = -40.9$~~ $\therefore$ 137 calculators

5) Solve $\dfrac{x+3}{x-5} = 5 + \dfrac{10}{x+1}$.

$$(x+3)(x+1) = 5(x-5)(x+1) + 10(x-5)$$

$$x^2 + 4x + 3 = 5x^2 - 20x - 25 + 10x - 50$$

$$0 = 4x^2 - 14x - 78$$

$$0 = 2x^2 - 7x - 39$$

$$0 = (2x-13)(x+3)$$

$$x = \frac{13}{2} \text{ or } x = -3$$

6) Solve $\frac{x+3}{x+1} \geq \frac{x-2}{x-3}$. State your answers in exact form (don't approximate).

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

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

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

$$f(x) \Rightarrow \boxed{\frac{x-7}{(x+1)(x-3)}} \geq 0$$

Interval	$x<-1$	$-1<x<3$	$3<x<7$	$x>7$
Sign of $f(x)$	-	+	-	+

$\therefore \frac{x+3}{x+1} \geq \frac{x-2}{x-3}$ when $-1<x<3$ or $x \geq 7$

7) Jarred can install 5 windows in *t* minutes. In triple the amount of time, Michelle can install 4 times as many windows. Working together, they can install 22 windows in 352 minutes. How long does it take Jarred to install one window? Round your final answer to the nearest tenth of a minute.

$$\frac{5}{t} + \frac{20}{3t} = \frac{22}{352}$$

$$5(3)(352) + 20(352) = 22(3t)$$

$$5280 + 7040 = 66t$$

$$12320 = 66t$$

$$t \approx 186.7$$

$$\frac{186.7}{5} \approx 37.3$$

$\therefore$ it takes Jared 37.3 minutes to install one window.

8) Consider the functions $f(x)=\dfrac{x^2-6x+8}{x^3-9x^2+26x-24}$ and $g(x)=\dfrac{x^2-6x+8}{x^3-9x^2+26x-24}+5$.

a) Janine claims that $f(x)$ and $g(x)$ both have the same horizontal asymptote. Is Janine's claim correct? Explain.

Janine's claim is incorrect. $f(x)$ will have a horizontal asymptote of $y=0$. $g(x)$ will have a horizontal asymptote of $y=5$, since $g(x)$ is $f(x)$ shifted up 5 units.

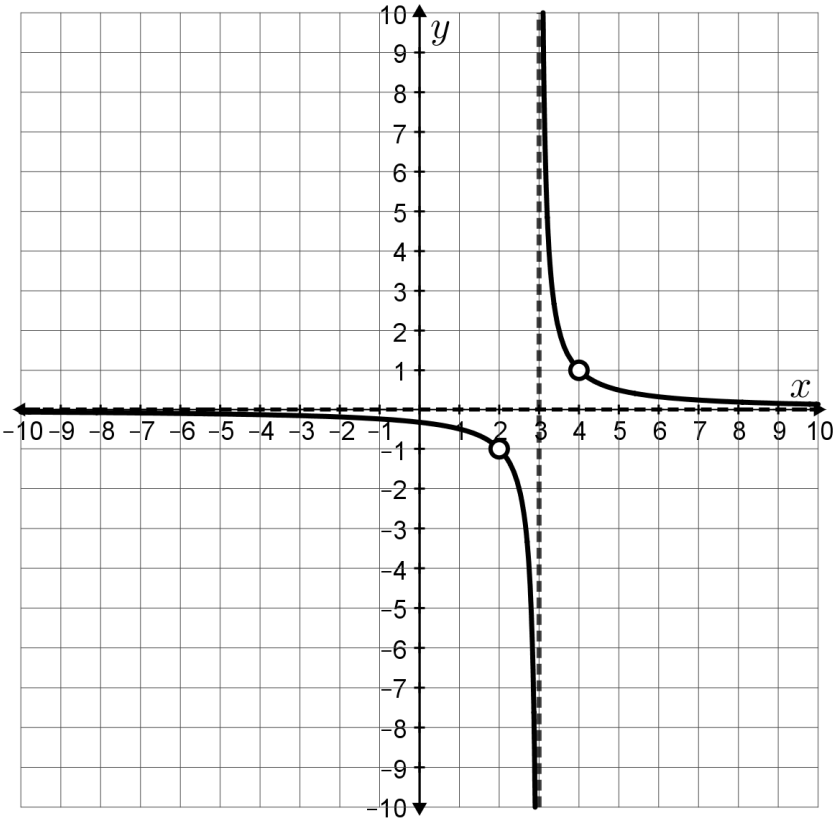
b) Janine's friend, Pedro, correctly rewrote the functions $f(x)$ and $g(x)$ as follows:

$$f(x)=\frac{(x-2)(x-4)}{(x-3)(x-2)(x-4)} \qquad g(x)=\frac{(x-2)(x-4)}{(x-3)(x-2)(x-4)}+5$$

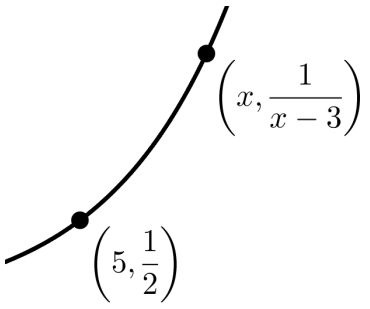
Will the holes in the graph of $f(x)$ occur at the same x-values as the holes in the graph of $g(x)$? ☑Yes ☐No (*check one*)

c) Choose **ONE** of the following. If more space is needed, use the back of this page.
i) Sketch a clearly labeled graph of $y=f(x)$.
ii) Determine, to the nearest hundredth, the instantaneous rate of change of $f(x)$ at $x=5$.

i) $f(x)=\dfrac{1}{x-3}$ with holes where $x=2$ and $x=4$.



ii) $f(x) = \dfrac{1}{x-3},\ x \neq 2, 4$



$$m_{\text{sec}} = \frac{\dfrac{1}{x-3} - \dfrac{1}{2}}{x-5} \quad \begin{matrix} \\ \times\ 2(x-3) \end{matrix}$$
$$\times\ 2(x-3)$$

$$= \frac{2-(x-3)}{2(x-3)(x-5)}$$

$$= \frac{5-x}{2(x-3)(x-5)}$$

$$= \frac{-\cancel{(x-5)}}{2(x-3)\cancel{(x-5)}}$$

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

From left:

x	m_{sec}
4.9	–0.263157894
4.99	–0.251256281
4.999	–0.250125062
4.9999	–0.2500125

From right:

x	m_{sec}
5.1	–0.238095238
5.01	–0.248756218
5.001	–0.249875062
5.0001	–0.2499875

$\therefore$ the instantaneous rate of change at $x = 5$ is -0.25