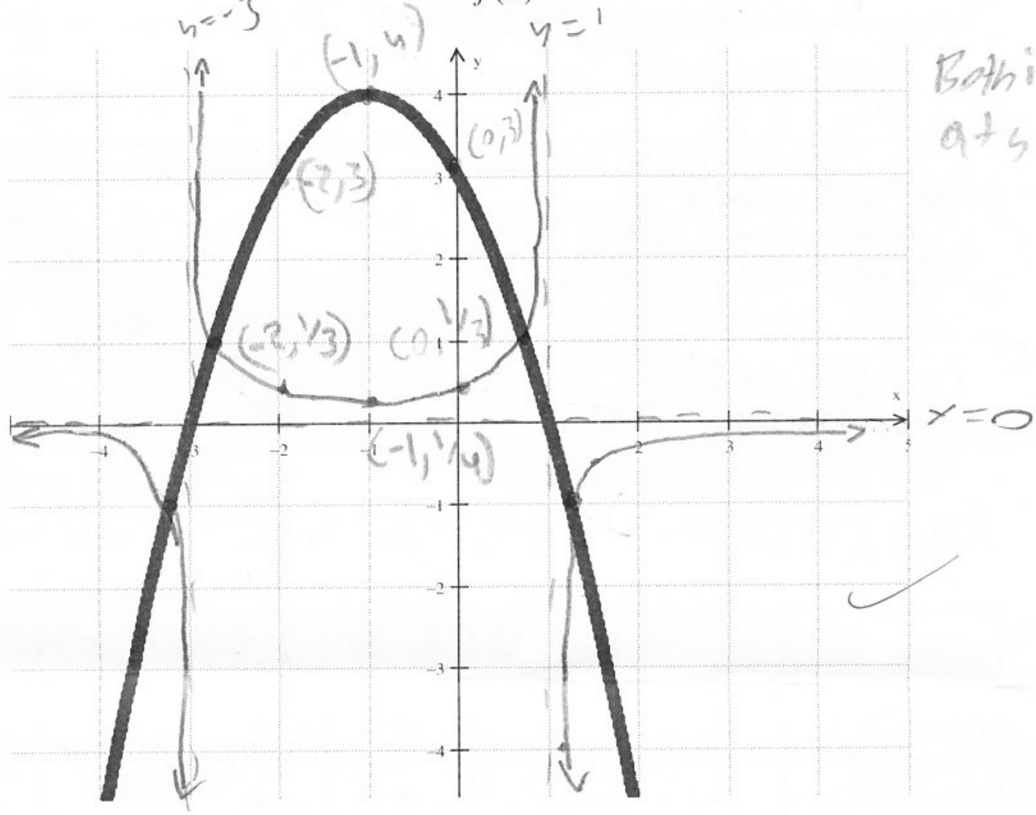
DATE: ____________________ **NAM**

KNOWLEDGE/UNDERSTANDING

1. Given the graph of $f(x)$, sketch the graph of $y = \dfrac{1}{f(x)}$. Include key points and asymptotes

[4]



Both intersect at y=1 and y=-1

2. Solve the following equation. State Restrictions and express your answer to two decimal places where necessary.

[8]

$$\frac{6}{x^2+x-6} - \frac{3}{x^2+4x+3} = \frac{4}{x^2+2x-3}$$

$\boxed{x \neq -3, 2, \pm 1, 1}$

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

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

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

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

$$\frac{3x^2+9x-12 - 4x^2+4x+8}{\cancel{(x+1)(x-2)(x-1)}} = 0$$

$-x^2+13x-4=0$

$-(x^2-13x+4)=0$

$x^2-13x+4=0$

$$x = \frac{13 \pm \sqrt{13^2-4(4)}}{2}$$

$$= \frac{13 \pm \sqrt{153}}{2}$$

$$x = \frac{13+\sqrt{153}}{2} = 12.68$$

$$x = \frac{13-\sqrt{153}}{2} = 0.32$$

$\boxed{x = 12.68 \text{ or } x = 0.32}$

3. Solve the rational inequality using the interval chart method.

$$\frac{2x-1}{x+7} > \frac{x+1}{x+3}$$

$\frac{3}{4}$ $\quad d > 6 \quad \frac{19}{12} > \frac{11}{13} \quad \frac{14}{2} > \frac{7}{11}$

[12]

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

$$\frac{(2x^2+5x-3)-(x^2+8x+7)}{(x+7)(x+3)} > 0$$

$$\frac{x^2-3x-10}{(x+7)(x+3)} > 0$$

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

$-7, -3, -2, 5$

	$(-\infty,-7)$	$(-7,-3)$	$(-3,-2)$	$(-2,5)$	$(5,\infty)$	
$(x+7)$	$-$	$+$	$+$	$+$	$+$	
$(x+3)$	$-$	$-$	$+$	$+$	$+$	
$(x+2)$	$-$	$-$	$-$	$+$	$+$	
$(x-5)$	$-$	$-$	$-$	$-$	$+$	
T.V.	-10	-4	-2.5	0	10	
Answer	$+$	$-$	$+$	$-$	$+$	

State your answer in:

Set Notation: $\{x \in R \mid -\infty < x < -7 \text{ or } -3 < x < -2 \text{ or } 5 < x < \infty\}$

Interval Notation: $x \in (-\infty,-7) \cup (-3,-2) \cup (5,\infty)$

	$(-\infty,1)$	$(1,2)$	$(2,4)$	$(4,\infty)$
$x-1$	$-$	$+$	$+$	$+$
$x-2$	$-$	$-$	$+$	$+$
$x-4$	$-$	$-$	$-$	$+$
	$-$	$+$	$-$	$+$

APPLICATION

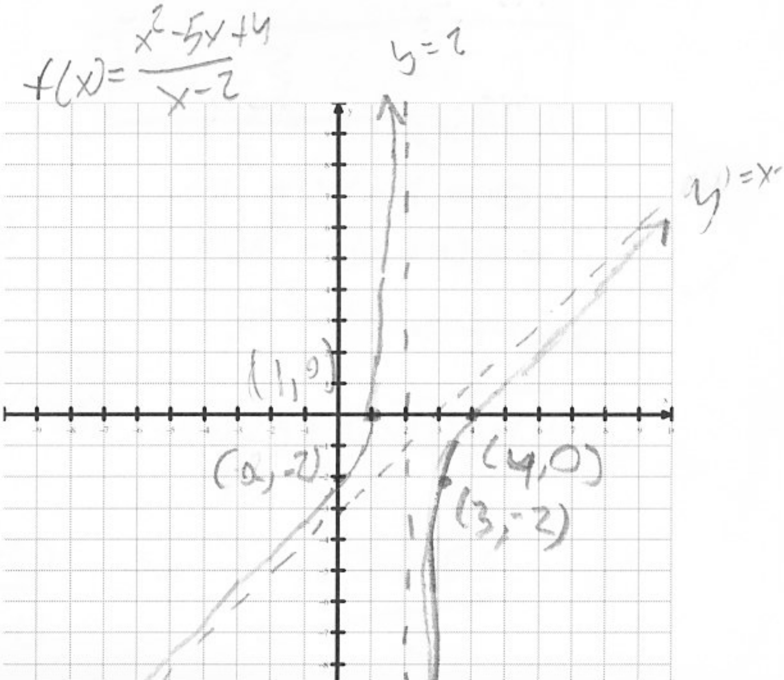
4. Given $f(x)=\dfrac{x^2-5x+4}{x-2}$, state the following: $=\dfrac{(x-4)(x-1)}{(x-2)}$

$$\begin{array}{r} x-3 \\ x-2\,\overline{)\,x^2-5x+4} \\ x^2-2x \\ \hline -3x+4 \\ -3x+6 \\ \hline -2 \end{array}$$

State the domain [1] $\{x\in R \mid x\neq 2\}$	x and y intercepts x-int $x=4,1$ y-int $y=-2$ [2]
State the equation of any vertical asymptote(s) [1] V.A at $x=2$	State the equation of any horizontal/oblique asymptote oblique asymptote [1] at $y=x-3$
Determine the behaviour near the vertical asymptote(s) $x\to 2^-$ $y\to\infty$ $x\to 2^+$ $y\to -\infty$ [2]	Determine the end behaviour $x\to -\infty$ $y\to -\infty$ $f(x)\to y=x-3$ $x\to\infty$ $y\to\infty$ -1 [2]
Intervals where f(x) > 0 $x\in(1,2)\cup(4,\infty)$ [1]	Intervals where f(x) < 0 $x\in(-\infty,1)\cup(2,4)$ [1]

Graph the function. Label all asymptotes and key points.

[4]



5. In the event of a power failure, a computer model estimates the temperature, T, in degrees Celsius, in a food-processing plant's freezer to be $T = \frac{2t^2}{t+1} - 15$, where t is the time, in hours, after the power failure. How long would it take for the temperature to reach 0^0 C?

[5]

$T = 0°C \qquad T = \frac{2t^2}{t+1} - 15$

$0 = \frac{2t^2}{t+1} - 15$

$= \frac{2t^2}{t+1} - \frac{15(t+1)}{(t+1)}$

$= \frac{2t^2 - 15t - 15}{t+1}$

$0 = 2t^2 - 15t - 5$

$t = 8.3935$

$t = -0.8935 \therefore t < 0 \therefore$ The second solution is not acceptable only positive time is acceptable

$t = 8.39 \leftarrow$ round to 2 decimals

$t = \frac{15 \pm \sqrt{15^2 - 4(2)(-15)}}{2(2)}$

$t = \frac{15 \pm \sqrt{345}}{4}$

$t = 8.3935$

$t = -0.8935$

$\therefore$ Then refrigerator will reach 0°C after around 8.39 hours or approximately 8 hours and 23 minutes

$0.39 \times 60 = 23.4$