

WRITE YOUR NAME:

MAC 2241 Homework 2

Due in class, Monday September 10th

You can use more paper if necessary, but please STAPLE

Question 1. Find the domain of the function.

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

Domain will be all x except where denominator is 0.

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

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

$$x+3 = 0 \text{ or } x-2 = 0$$

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

Domain: all x except $-3, 2$.

Interval notation: $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$

can factor
by trial
and error

Question 2. Find the domain of the function.

$$f(u) = \frac{u+1}{1 + \frac{1}{u+1}}$$

Since the expression contains $\frac{1}{u+1}$ somewhere,

We cannot have $u+1 = 0$,

i.e. we cannot have $u = -1$.

Also, since we divide by $1 + \frac{1}{u+1}$ somewhere,

we cannot have $1 + \frac{1}{u+1} = 0$

$$\text{i.e. } \frac{1}{u+1} = -1$$

$$u+1 = -1$$

$$u = -2$$

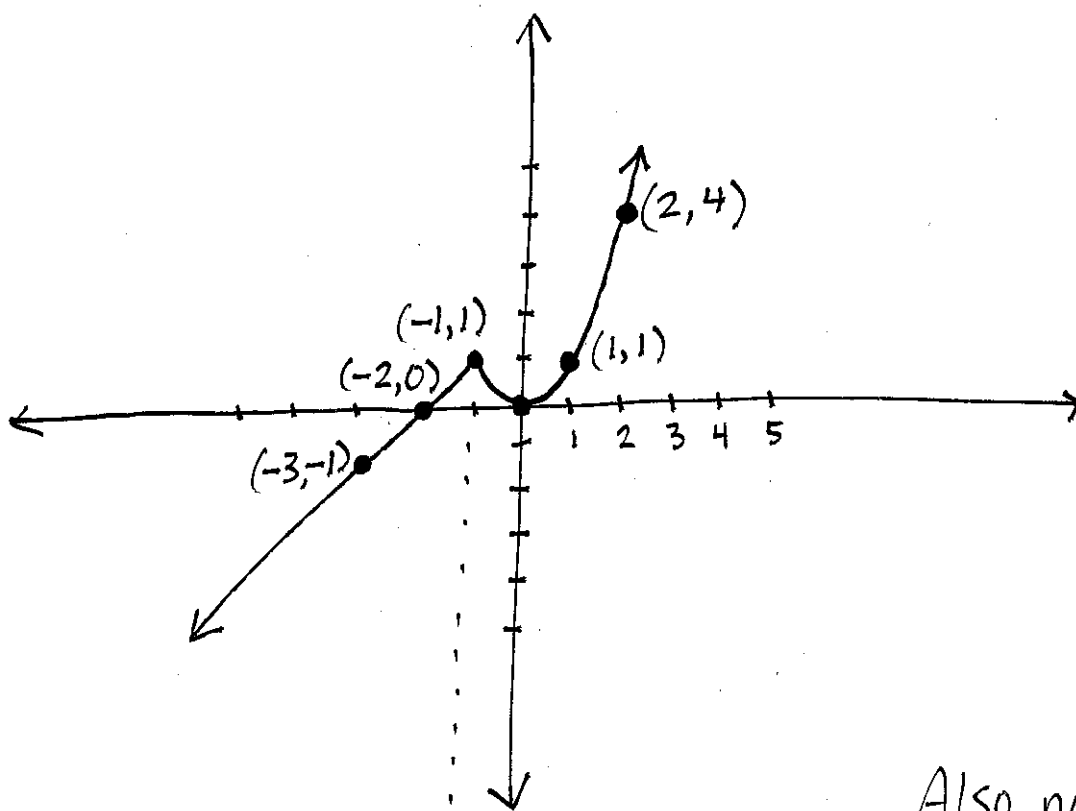
Answer: All values of u except $-1, -2$.

$$(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$$

Question 3. Find the domain and sketch the graph of the function.

$$f(x) = \begin{cases} x+2 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$$

Domain is all real numbers.



This part
looks like
 $y = x + 2$
(line)

This part
looks like
 $y = x^2$
(parabola)

Also notice that
the two formulas
 $y = x + 2$ and $y = x^2$
agree with each other
when $x = -1$

Question 4. Sketch the graph of the function.

$$f(x) = \frac{2}{x} - 2$$

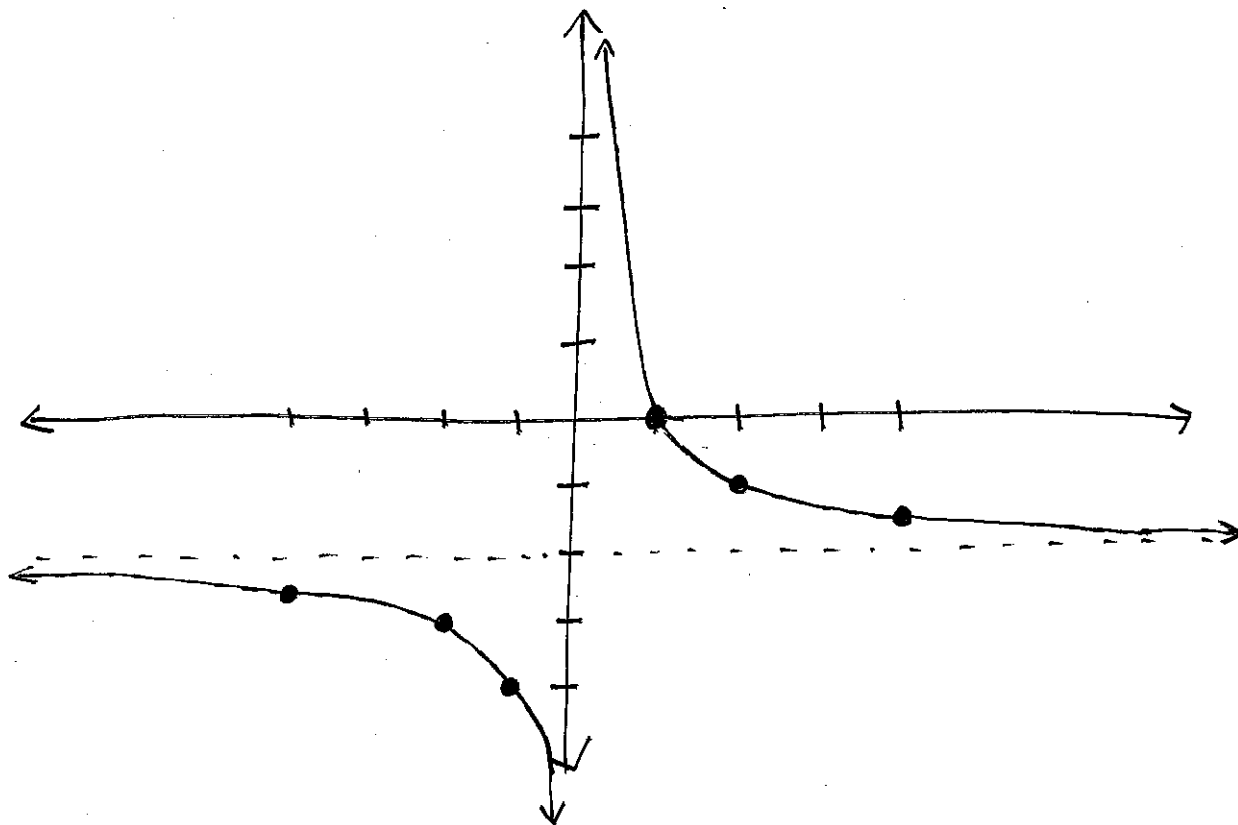
Some examples of inputs and outputs

<u>x</u>	<u>"Middle step" $\frac{2}{x}$</u>	<u>Output $\frac{2}{x} - 2$</u>
-2000	$\frac{2}{-2000} = -0.001$	-2.001
-4	$\frac{2}{-4} = -0.5$	-2.5
-2	$\frac{2}{-2} = -1$	-3
-1	$\frac{2}{-1} = -2$	-4
-0.001	$\frac{2}{-0.001} = -2000$	-2002
0.001	$\frac{2}{0.001} = 2000$	1998
1	$\frac{2}{1} = 2$	0
2	$\frac{2}{2} = 1$	-1
4	$\frac{2}{4} = 0.5$	-1.5
2000	$\frac{2}{2000} = 0.001$	-1.999

Graph on next page

Question 4. Sketch the graph of the function.

$$f(x) = \frac{2}{x} - 2$$



Question 5. Simplify the expressions.

- $\frac{4^{-3}}{2^{-8}}$
- $8^{4/3}$
- $\frac{x^{2n} \cdot x^{3n-1}}{x^{n+2}}$

$$(i) \quad \frac{4^{-3}}{2^{-8}} = \frac{(2^2)^{-3}}{2^{-8}} = \frac{2^{-6}}{2^{-8}} = \frac{2^8}{2^6} = 2^2 = 4$$

$$(ii) \quad 8^{4/3} = (2^3)^{4/3} = 2^4 = 16$$

$$(iii) \quad \frac{x^{2n} \cdot x^{3n-1}}{x^{n+2}} = \frac{x^{5n-1}}{x^{n+2}} = x^{(5n-1)-(n+2)}$$
$$= x^{5n-1-n-2} = x^{4n-3}$$