Important Information:

how the graph ends

what the ends are doing

Degree? Use $-3x^2 + 4x - 1$ to help with understanding the terms

highest exponent 2

Standard Form?

order exponents from greatest to least

Leading Term?

leading coefficent, variable, and highest exponent $-3x^2$

Leading Coefficient?

just the number in front of leading term -3

~~**Local Extrema?**~~ End Behavior

~~**Absolute Extrema?**~~ What the ends of the graph are doing

$x \to \quad f(x) \to$

Part A: Determine if f is odd, even, or neither

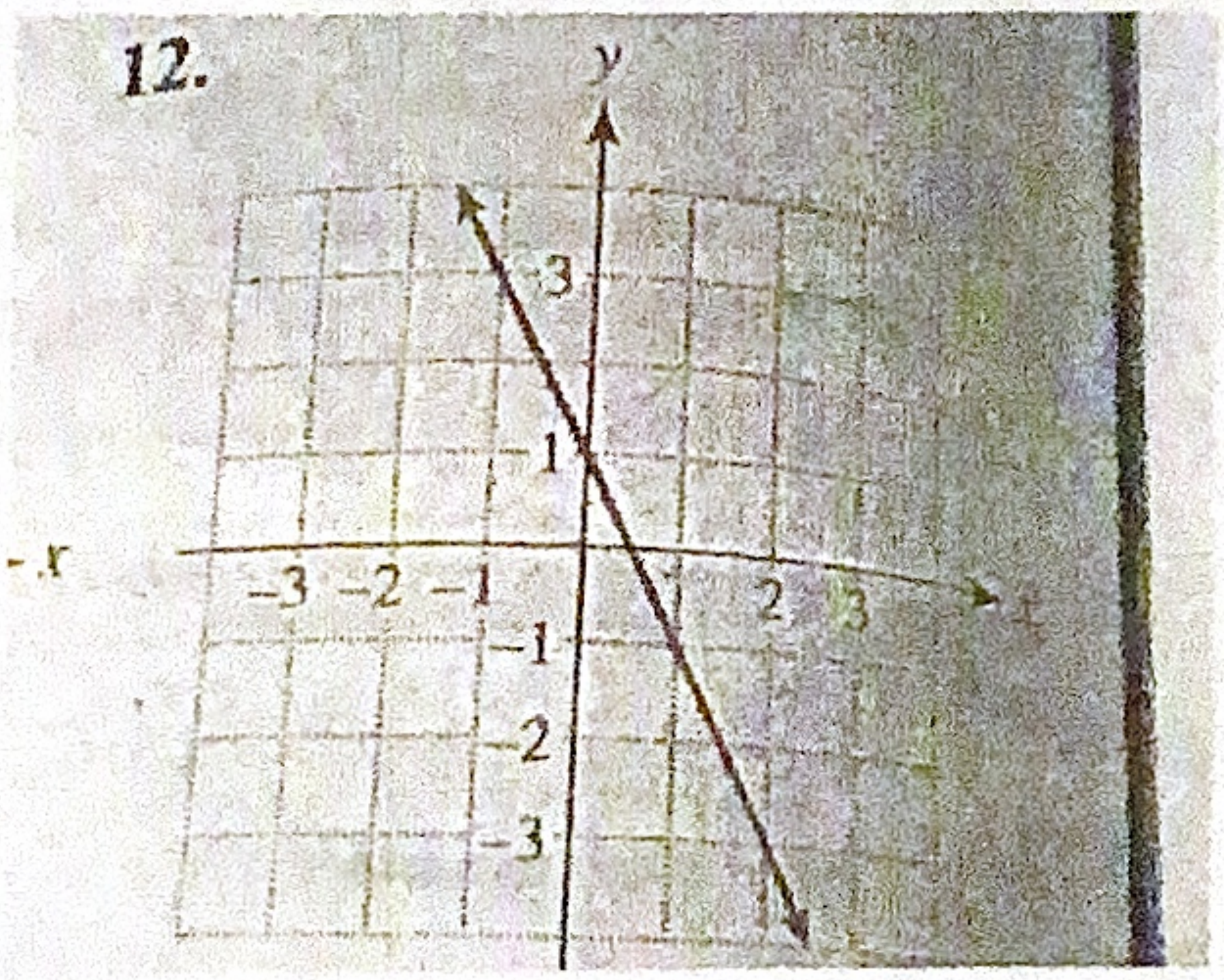
1. $f(x) = x + 3$
2. $f(x) = -x^6 + 5x^2$
3. $f(x) = \sqrt{1 - x^2}$

Right: $x \to \infty,\ f(x) \to -\infty$

Left: $x \to -\infty,\ f(x) \to -\infty$

Part B: Fill in the table

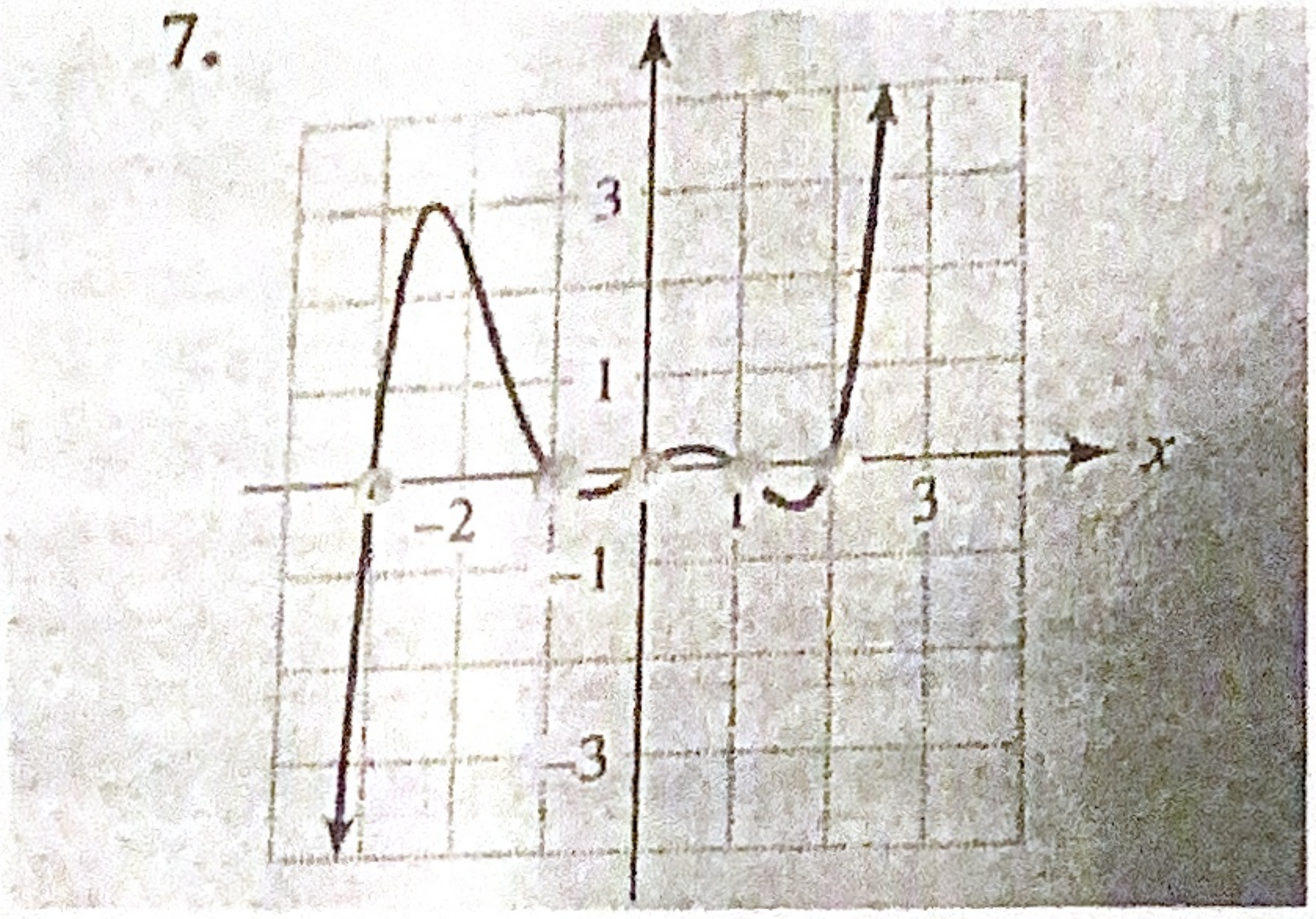
1.



~~Turning Points~~
Estimate x – intercepts $\left(\frac{1}{2}, 0\right)$
Whether a > 0 or a < 0 negative
~~Local extrema~~
~~Absolute extrema~~
End Behavior $x \to \infty,\ f(x) \to -\infty$ $x \to -\infty,\ f(x) \to \infty$

2.

7.



~~Turning Points~~

Estimate x-intercepts

(-3,0), (-1,0), (0,0), (1,0), (2,0)

Whether a > 0 or a < 0

Positive

~~Local extrema~~

~~Absolute extrema~~

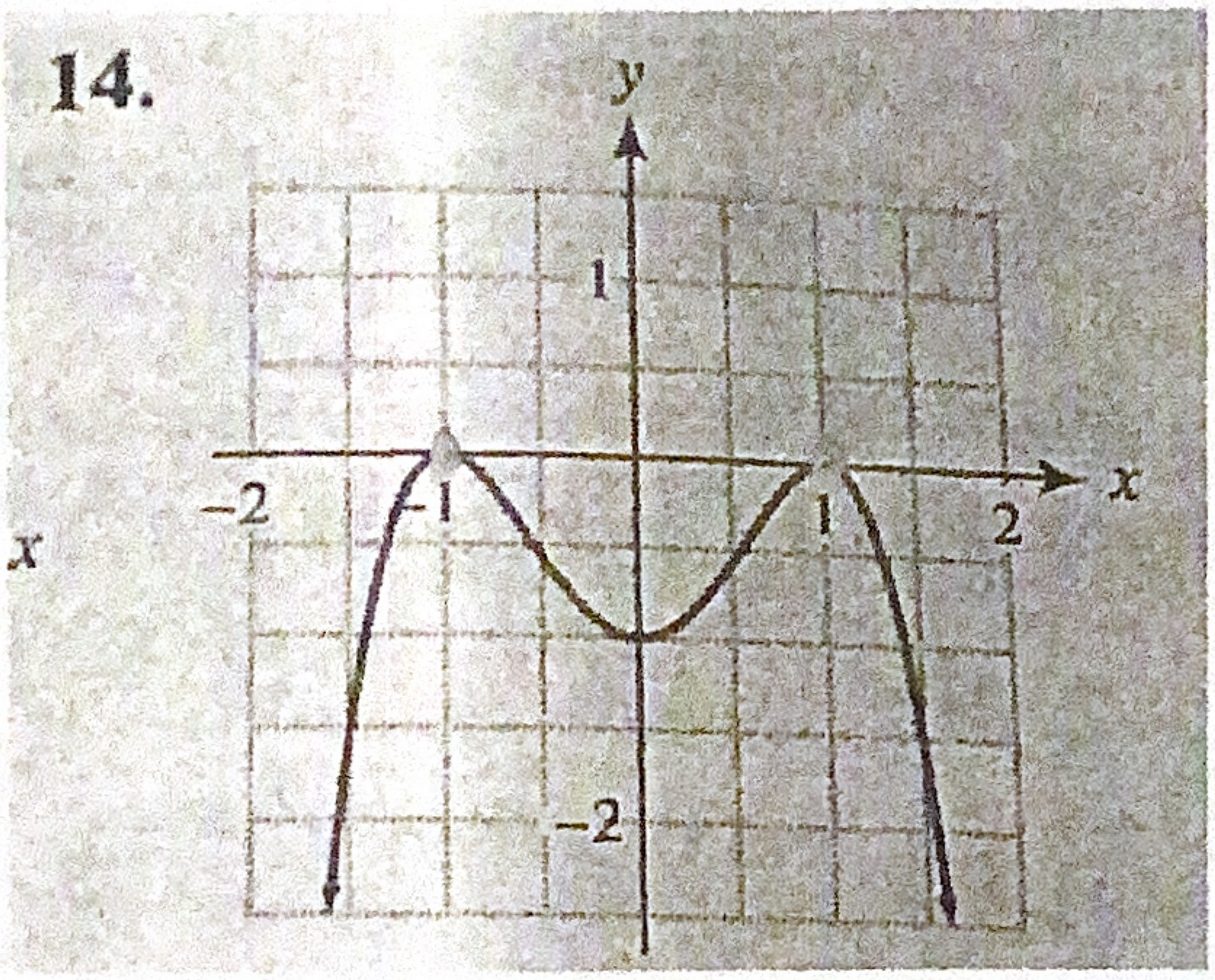
End Behavior

$x \to \infty$, $f(x) \to \infty$

$x \to -\infty$, $f(x) \to -\infty$

3.

14.



x

~~Turning Points~~

Estimate x – intercepts

(-1,0) (1,0)

Whether a > 0 or a < 0

negative

~~Local extrema~~

~~Absolute extrema~~

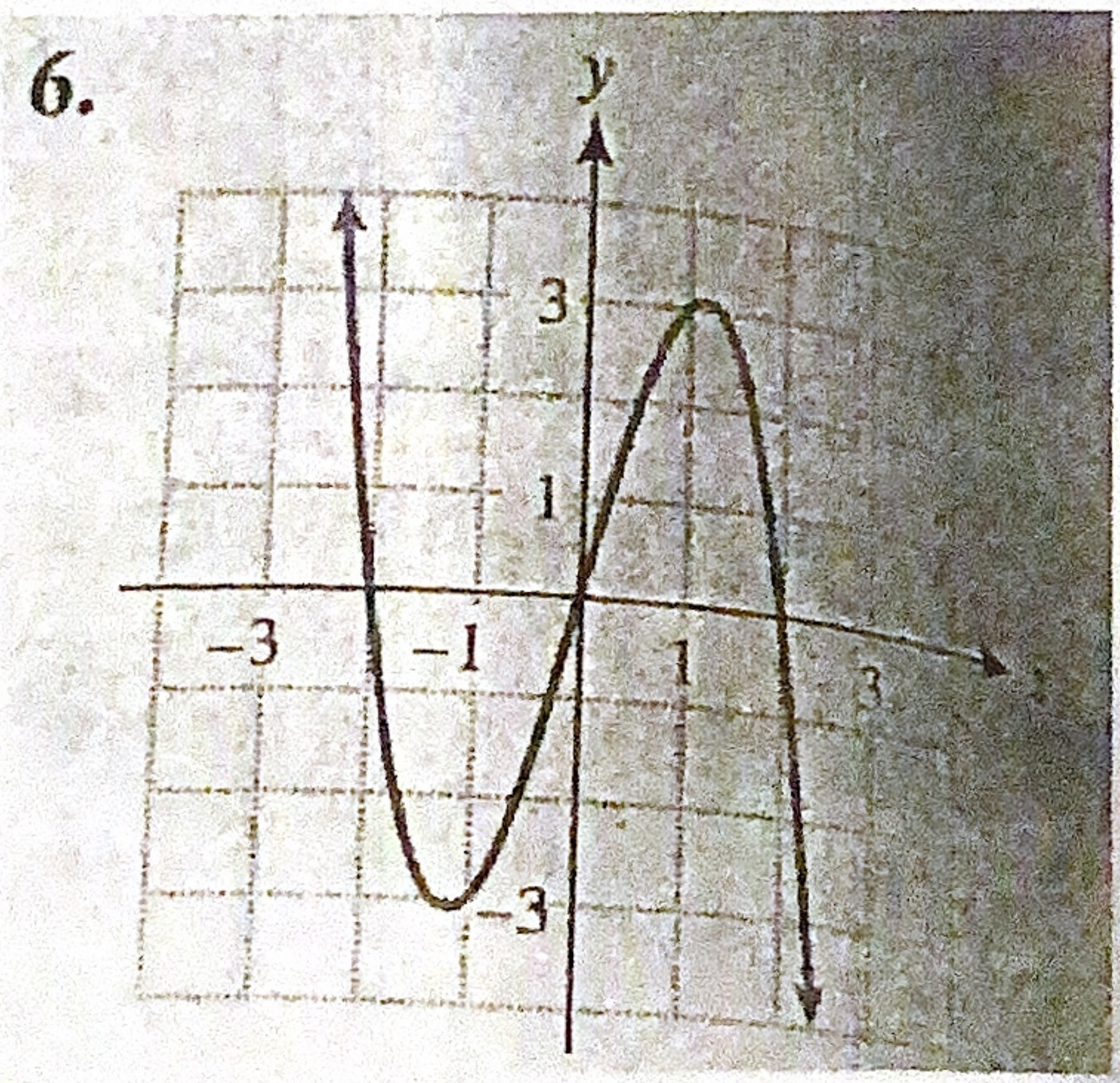
End Behavior

$x \to \infty$, $f(x) \to -\infty$

$x \to -\infty$, $f(x) \to -\infty$

4.

6.



~~Turning Points~~

Estimate x – intercepts

(-2,0) (0,0) (2,0)

Whether a > 0 or a < 0

negative

~~Local extrema~~

~~Absolute Extrema~~

End Behavior

$x \to \infty$, $f(x) \to -\infty$

$x \to -\infty$, $f(x) \to \infty$

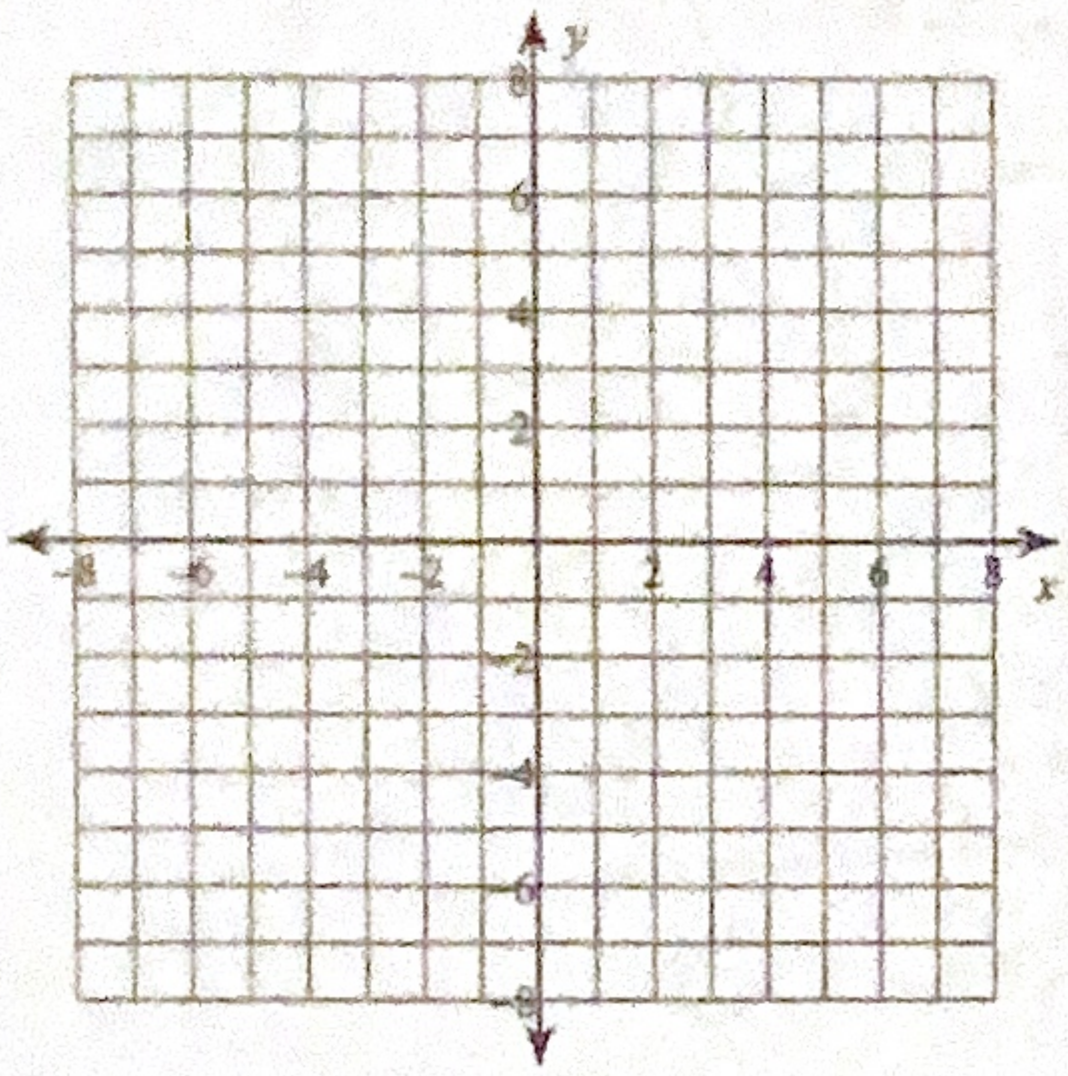
Kuta Software - Infinite Algebra 2 Name____________________

Graphing Polynomial Functions

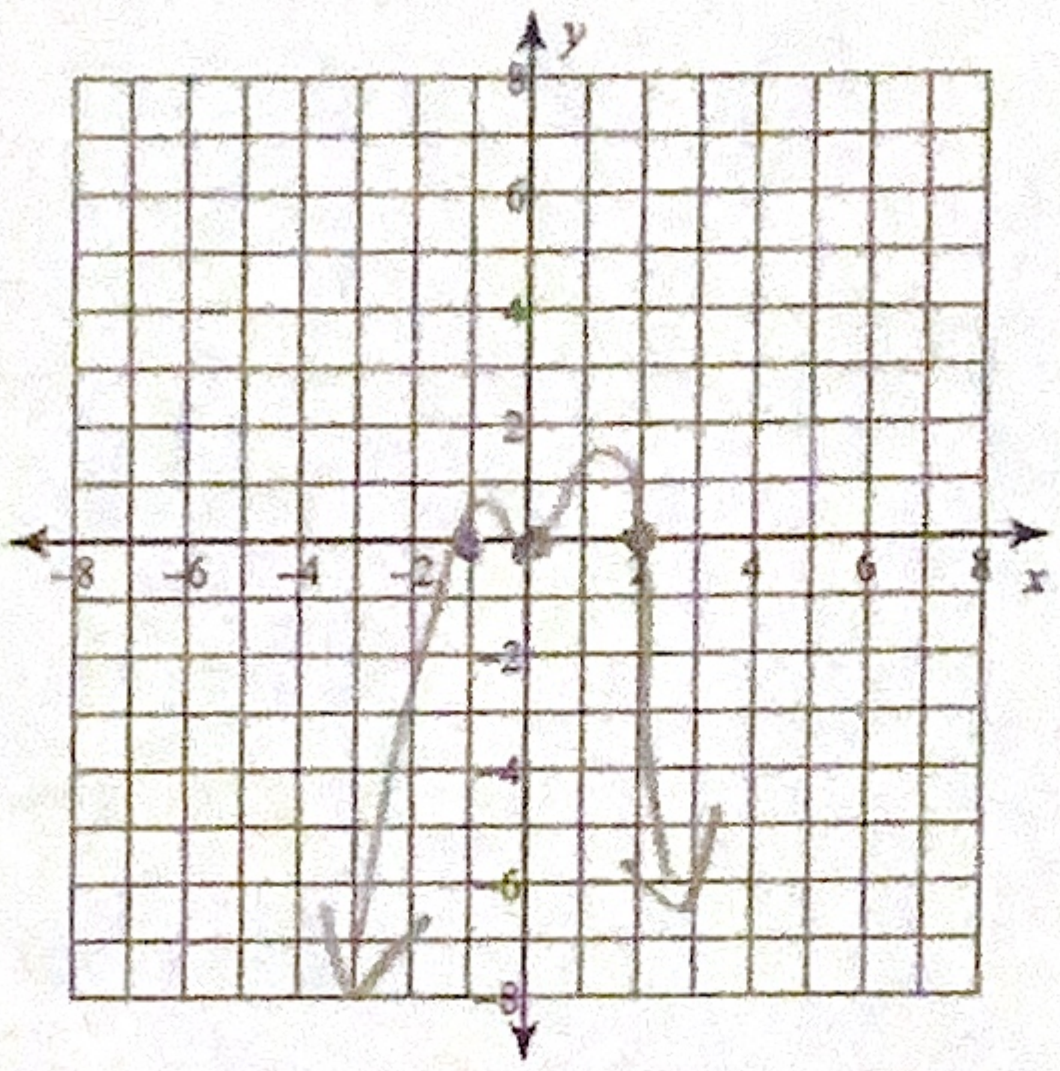
Date________________ Period____

State the maximum number of turns the graph of each function could make. Then sketch the graph. State the number of real zeros. Approximate each zero to the nearest tenth. Approximate the relative minima and relative maxima to the nearest tenth.

1) $f(x) = x^2 + 2x - 5$



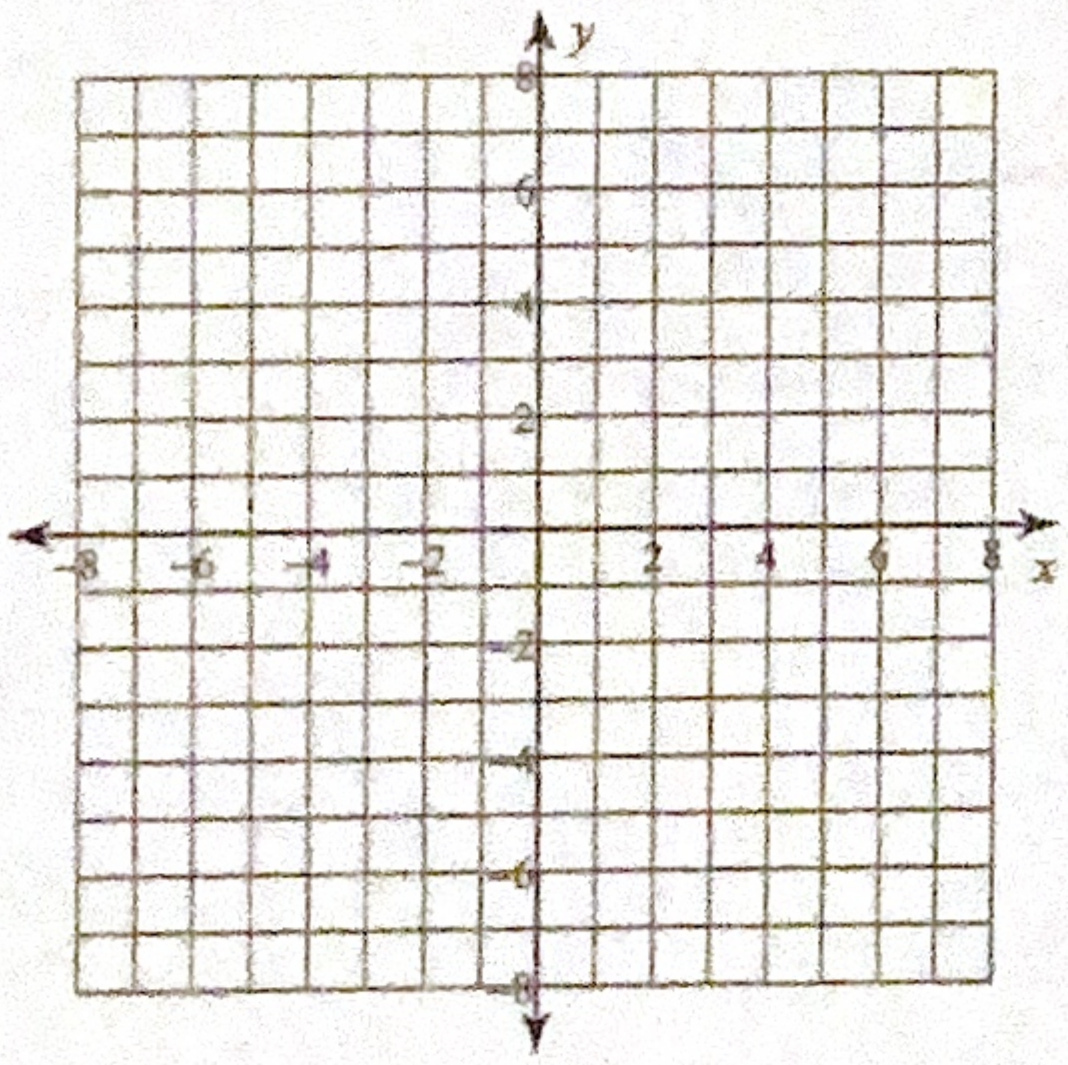
2) $f(x) = -x^4 + x^3 + 2x^2$



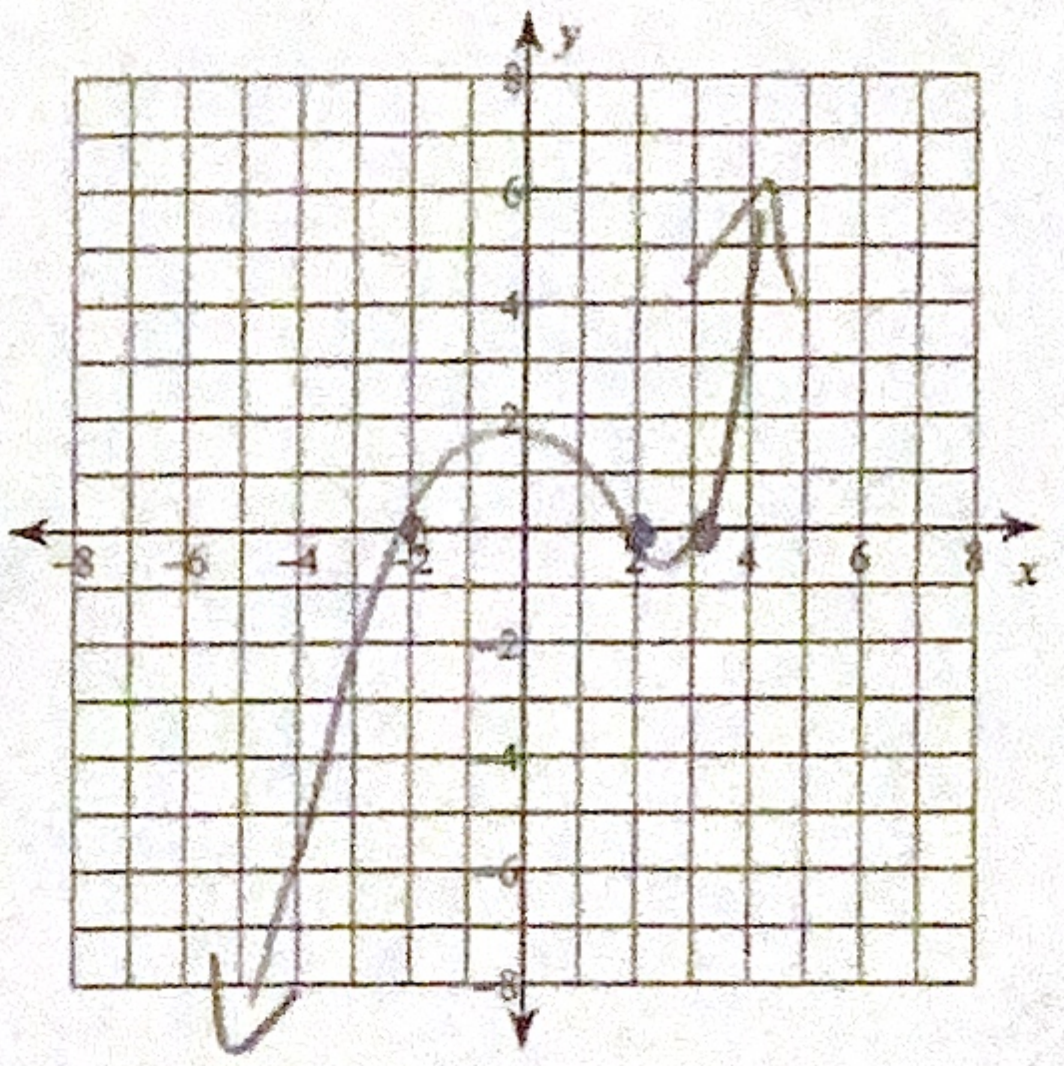
Even → same

– → down

3) $f(x) = x^4 - 4x^3 + 2x^2 + x + 4$



4) $f(x) = x^3 - 3x^2 - 4x + 12$



odd → opposite

+ → up

$(x^3 - 3x^2)\ (-4x + 12)$

$x^2(x-3)\ -4(x-3)$

$(x^2 - 4)\ (x-3)$

$(x+2)\ (x-2)\ (x-3)$

SI SESSION

Divide the polynomials.

1. $\frac{x^4-3x^3-x+3}{x-3}$

$$\begin{array}{r} x^3+0x^2+0x-1 \\ x-3\overline{)\,x^4-3x^3+0x^2-x+3} \\ -(x^4-3x^3)\downarrow \\ 0+0x^3+0x^2 \\ -(0x^3+0x^2)\downarrow \\ 0x^2-x \\ -(0x^2-0x)\downarrow \\ 0-x+3 \\ -(-x+3) \\ 0 \end{array}$$

$x^3 \cdot x$

$x^3 \cdot -3$

$0x^2 \cdot x$

$0x^2 \cdot -3$

x^3+0x^2+0x-1

$\downarrow$

x^3-1

If missing a placeholder?
For long division, use the three-step method: 1. 2. 3.

2. $\frac{3x^3+11x^2+9x-5}{x+2}$

	$3x^2$	$5x$	-1
x	$3x^3$	$5x^2$	$-x$
$+2$	$6x^2$	$10x$	-2

$-5+2=-3$

$3x^2+5x-1+\frac{-3}{x+2}$

or

$3x^2+5x-1-\frac{3}{x+2}$

3. $\frac{15x^3+37x^2+53x+55}{3x+5}$

4. $\frac{20x^4+6x^3-2x^2+15x-2}{5x-1}$

	$4x^3$	$2x^2$	$0x$	3
$5x$	$20x^4$	$10x^3$	$0x^2$	$15x$
-1	$-4x^3$	$-2x^2$	$0x$	-3

$20x^4 +$

$4x^3+2x^2+3+\frac{1}{5x-1}$

SI SESSION

NEED TO KNOW:

What does it mean to have an asymptote?

A line / section of the graph where your function will not cross

What does it mean to have a hole?

How to find vertical asymptotes and how is it represented?

Set denominator = to 0

$x = \#$

How to find horizontal asymptotes and how is it represented?

Look at exponents

$y = \#$

BOBO BOT N EATS DC

$= 0$ None

How to find slant asymptotes and how is it represented?

BOT U — undefined or none

BETC — $\div$ coefficients

How to find holes and how is it represented?

How to find the domain?

- x-intercepts
- y-intercepts
- vertical asymptote
- horizontal asymptote

Part A: Find the horizontal and vertical asymptotes

1. $f(x) = \frac{x^2-9}{x+3}$ $\rightarrow \frac{(x+3)(x-3)}{(x+3)}$

HA: None VA: none

$x^2 - 9 = 0$
$+9 \quad +9$
$\sqrt{x^2} = \sqrt{9}$ $x = \pm 3$

2. $f(x) = \frac{x+6}{5-2x}$ $\rightarrow \frac{x+6}{-2x+5} \rightarrow \frac{1}{-2}$

HA: $y = -1/2$ VA: $x = \frac{5}{2}$

$-2x + 5 = 0$
$-5 \quad -5$
$-2x = -5$ $\frac{5}{2}$

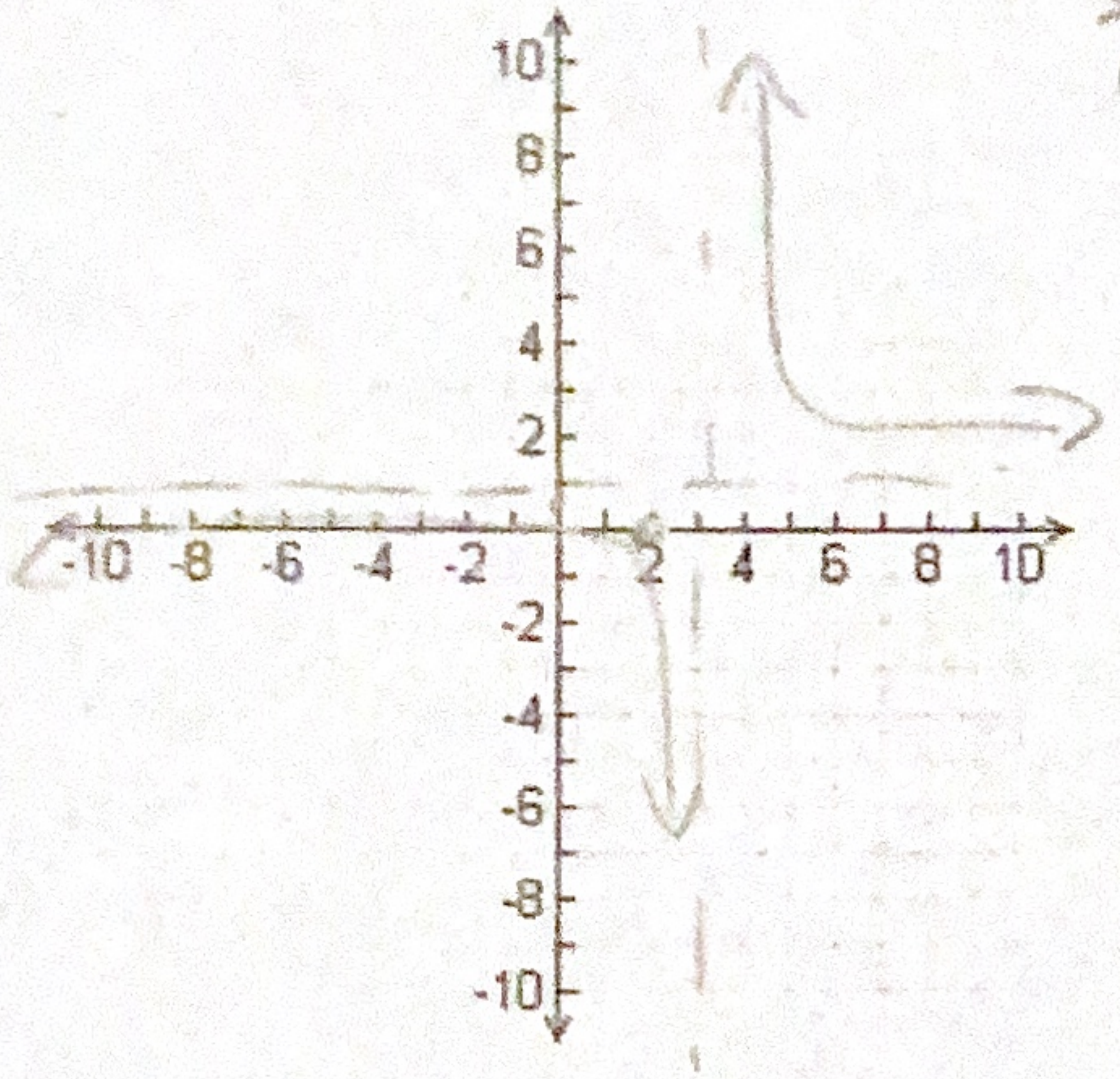
2. $f(x) = \frac{x^2-x-2}{x^2-2x-3} = \frac{\cancel{(x+1)}(x-2)}{\cancel{(x+1)}(x-3)}$

Multiply: -2
Add: -1

Multiply: -3
Add: -2

-3 1

$\frac{0-2}{0-3} = \rightarrow \frac{2}{3}$



x-intercepts: (2, 0)

y-intercepts: (0, 2/3)

vertical asymptotes: $x = 3$ $\quad x-3=0$

horizontal asymptotes: $y = 1$

~~holes~~

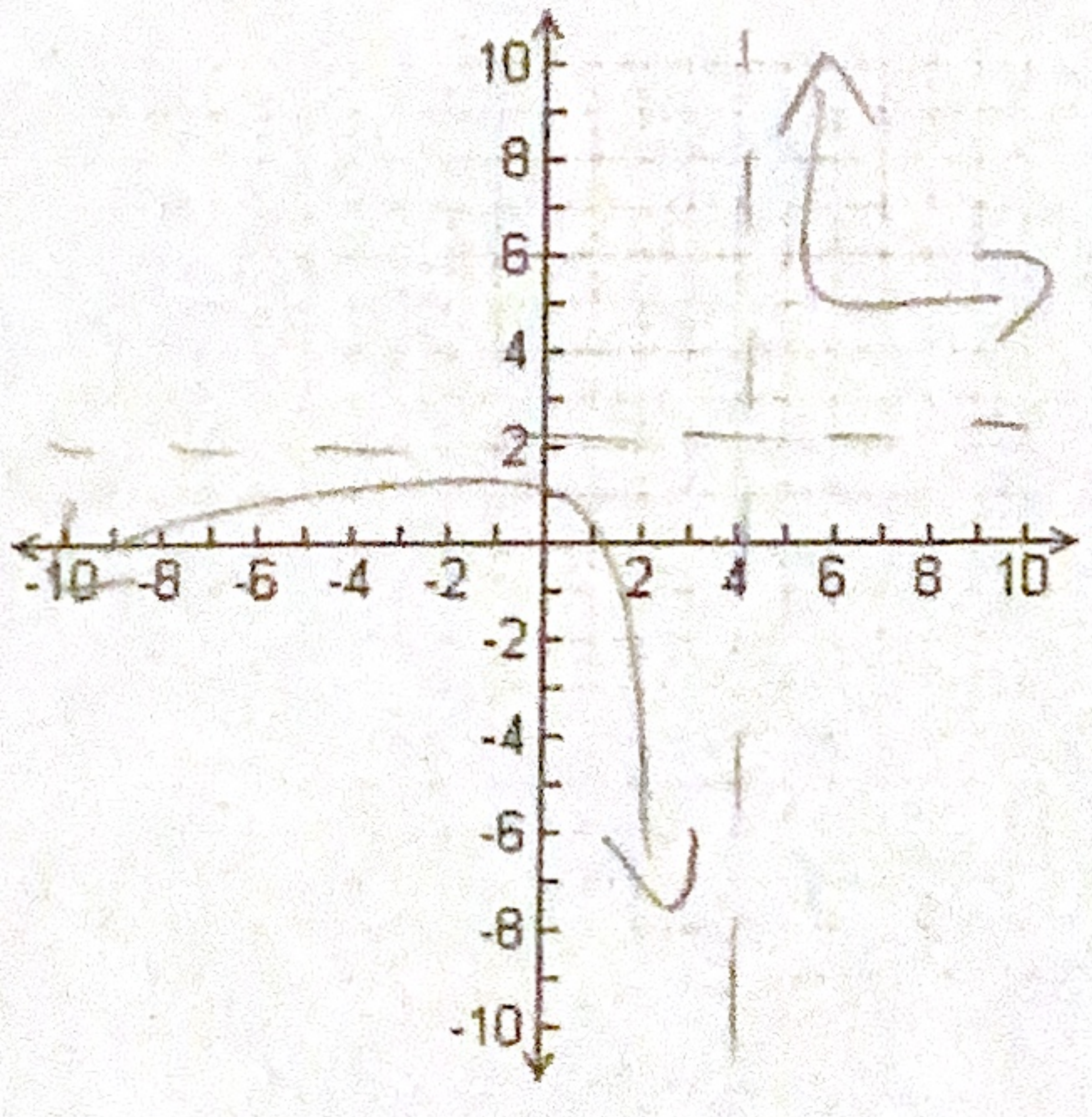
3. $f(x) = \frac{2x^2-3x-14}{x^2-2x-8} = \frac{(2x-7)\cancel{(x+2)}}{(x-4)\cancel{(x+2)}}$

$\frac{2}{1}$ ⟵

$2x^2-3x-14$
$x^2-3x-28$

Mult. -28
Add: -3

-7 4



x-intercepts: (7/2, 0) $\quad 2x-7=0 \quad$ +7 +7 $\quad \frac{2x}{2} = \frac{7}{2}$

y-intercepts: (0, 7/4)

vertical asymptotes: $x = 4$ $\quad x-4=0$ +4 +4 $x=4$

horizontal asymptotes: $y = 2$

~~holes~~

x^2-2x-8

Mult.: -8
Add: -2

-4 2

$(x-\frac{7}{2})\ (x+\frac{4}{2})$

$(2x-7)\ (x+2)$

$\frac{2(0)-7}{0-4} = \frac{-7}{-4} \rightarrow \frac{7}{4}$

$$\frac{3x^3+11x^2+9x-5}{x+2}$$

$$\begin{array}{r l}
 & 3x^2+5x-1 \\
\hline
x+2 \,\big) & 3x^3+11x^2+9x-5 \\
 & -(3x^3+6x^2) \downarrow \\
\hline
 & 0+5x^2+9x \\
 & -(5x^2+10x) \downarrow \\
\hline
 & 0-1x-5 \\
 & -(-x-2) \\
\hline
 & 0-3
\end{array}$$

$$3x^2+5x-1-\frac{3}{x+2}$$

or

$$3x^2+5x-1+\frac{-3}{x+2}$$

$$\begin{array}{r l}
 & 4x^3+2x^2+0x+3 \\
\hline
5x-1 \,\big) & 20x^4+6x^3-2x^2+15x-2 \\
 & -(20x^4-4x^3) \downarrow \\
\hline
 & 0+10x^3-2x^2 \\
 & -(10x^3-2x^2) \downarrow \\
\hline
 & 0+0x^2+15x \\
 & -(0x^2+0x) \downarrow \\
\hline
 & 0+15x-2 \\
 & -(15x-3) \\
\hline
 & 0+1 \\
 & \uparrow
\end{array}$$

$$4x^3+2x^2+3+\frac{1}{5x-1}$$