TURN AND TALK

$$(2x^3 - 3x^2 + 5x - 7) \div (x - 4)$$

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$$(2x^3 - 3x^2 + 5x - 7) \div (x - 4)$$

$$2x^2 + 5x + 25 + \frac{93}{x - 4}$$

2-03 POLYNOMIAL EQUATIONS

In this section, you will:

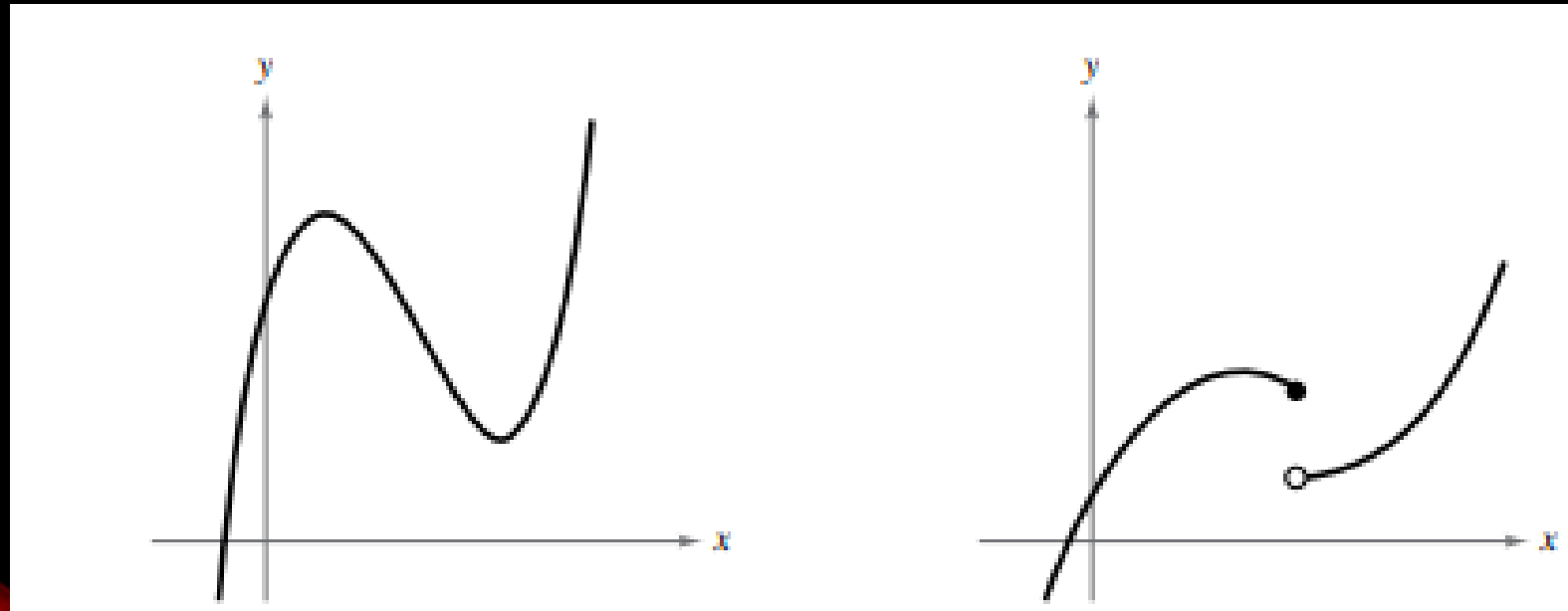
- Identify polynomial functions.
- Identify the end behavior.
- Graph polynomial functions.
- Write polynomial functions.

1. **Polynomial** - 多项式 (duō xiàng shì)
2. **Degree** - 次数 (cì shù)
3. **Coefficient** - 系数 (xì shù)
4. **Term** - 项 (xiàng)
5. **Constant term** - 常数项 (cháng shù xiàng)
6. **Variable** - 变量 (biàn liàng)
7. **Like terms** - 同类项 (tóng lèi xiàng)
8. **Factorization** - 因式分解 (yīn shì fēn jiě)

1. **Cubic** - 立方的 (lì fāng de)
2. **Quartic** - 四次的 (sì cì de)
3. **Quintic** - 五次的 (wǔ cì de)

- Reminders
- Exam 19th January – polynomials and rational functions
- Presentations start 19th January – opportunity to respond to feedback such as APPLICATION

CONTINUOUS GRAPHS



(a) Polynomial functions have continuous graphs.

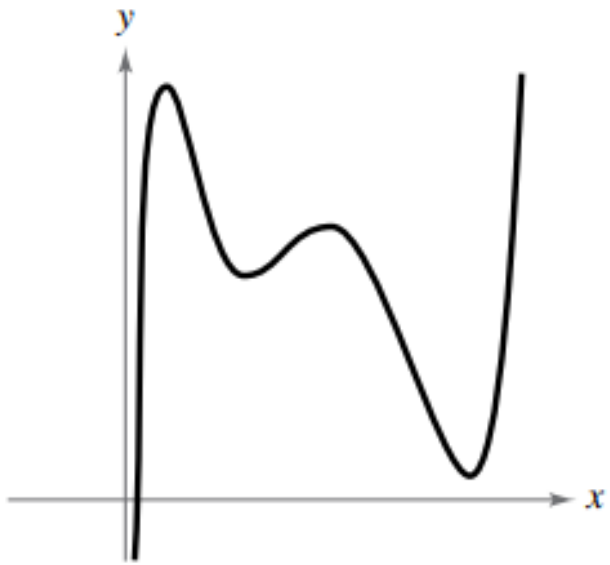
(b) Functions with graphs that are not continuous are not polynomial functions.

Figure 2.5

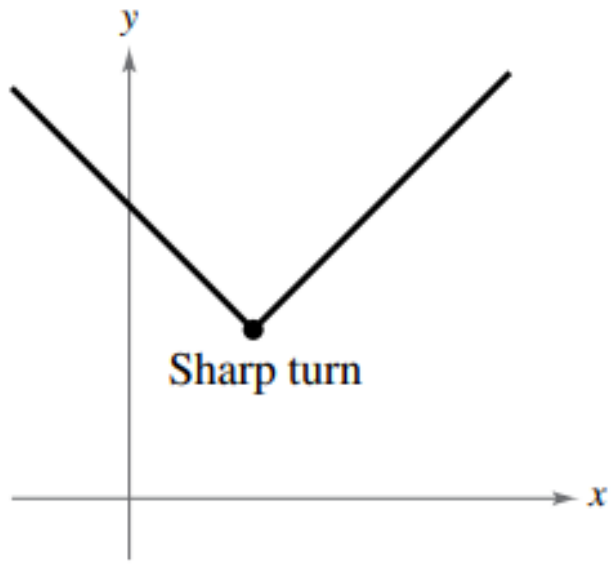
Smooth function: 光滑函数 (guāng huá hán shù)

Non-smooth function: 非光滑函数 (fēi guāng huá hán shù)

SMOOTH, ROUNDED TURNS



(a) Polynomial functions have graphs with smooth, rounded turns.



(b) Functions with graphs that have sharp turns are not polynomial functions.

Figure 2.6

Exercise: Identify whether the following functions are smooth or non-smooth.

1. $f(x) = x^2$
   - Is it smooth? Why or why not?
2. $g(x) = |x|$
   - Is it smooth? Why or why not?
3. $h(x) = \sin(x)$
   - Is it smooth? Why or why not?
4. $j(x) = \frac{1}{x}$ **for** $x \neq 0$
   - Is it smooth? Why or why not?

2-03 POLYNOMIAL EQUATIONS

- Polynomial Function
- $f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0$

- a_n are coefficients
- $a_n x^n$ are terms
- a_0 is constant term
- Degree is highest exponent
- Leading coefficient is coefficient of term with highest exponent
- Graphs are continuous, smooth, rounded turns

2-03 POLYNOMIAL EQUATIONS

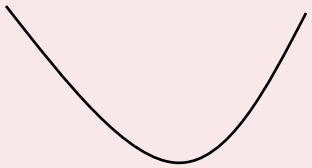
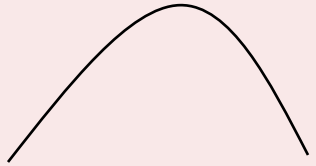
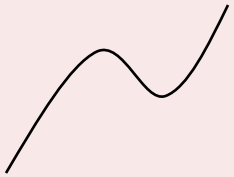
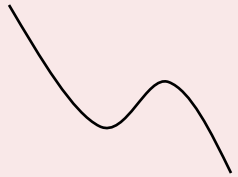
- End Behavior
  - Polynomial functions always go towards ∞ or -∞ at either end of the graph

	Leading Coefficient +	Leading Coefficient -
Even Degree		
Odd Degree		

- What is the end behavior of $f(x) = \frac{1}{3}x^3 + 5x$?

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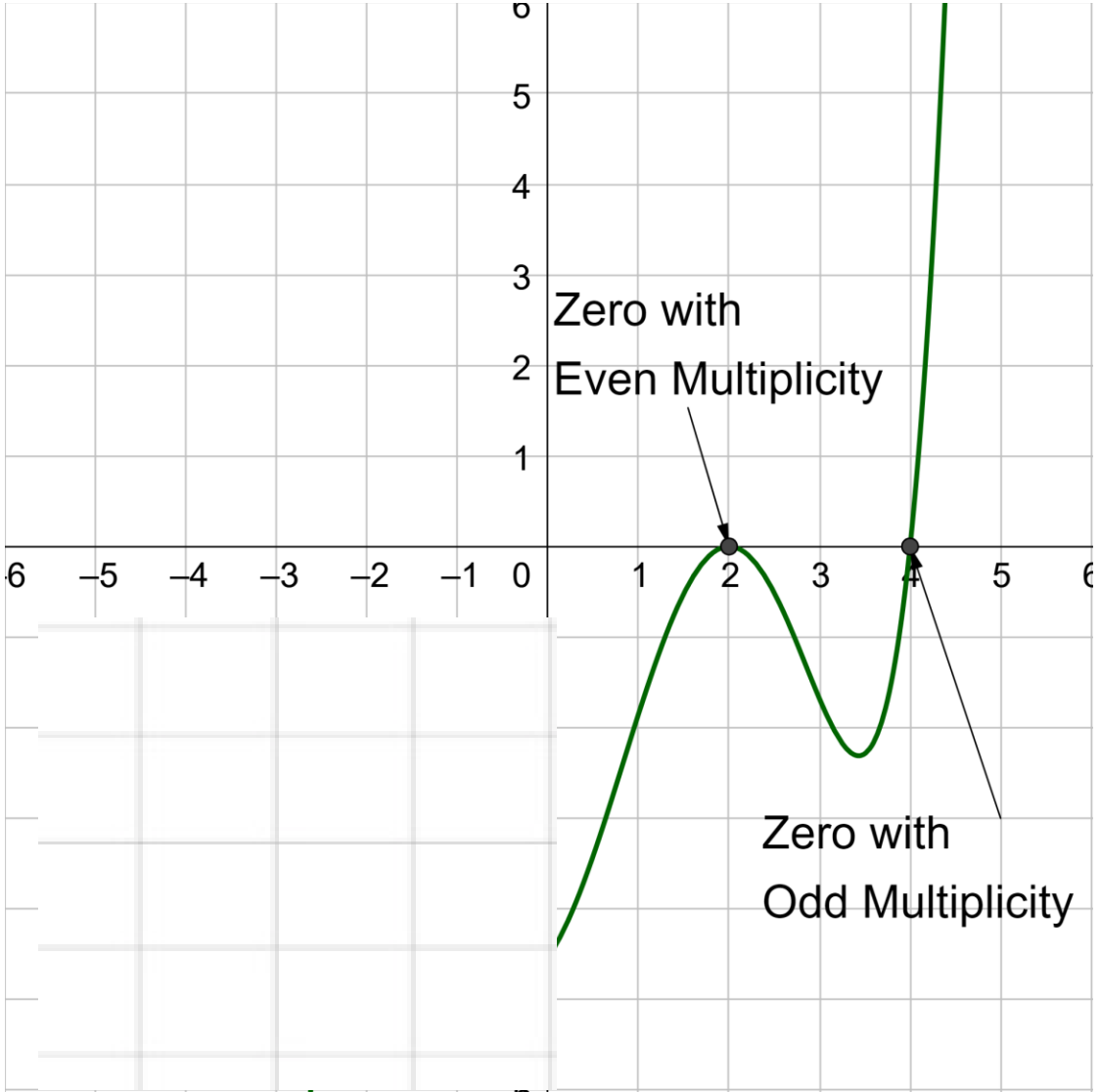
2-03 POLYNOMIAL EQUATIONS

- Zeros
- If $x = a$ is a zero of $f(x)$
  - $x = a$ is a solution to $f(x) = 0$
  - $(a, 0)$ is [redacted]
  - $(x - a)$ is a [redacted] of $f(x)$
- Let $f(x)$ have degree n
  - At most n zeros (can be repeated)
  - At most [redacted] turning points

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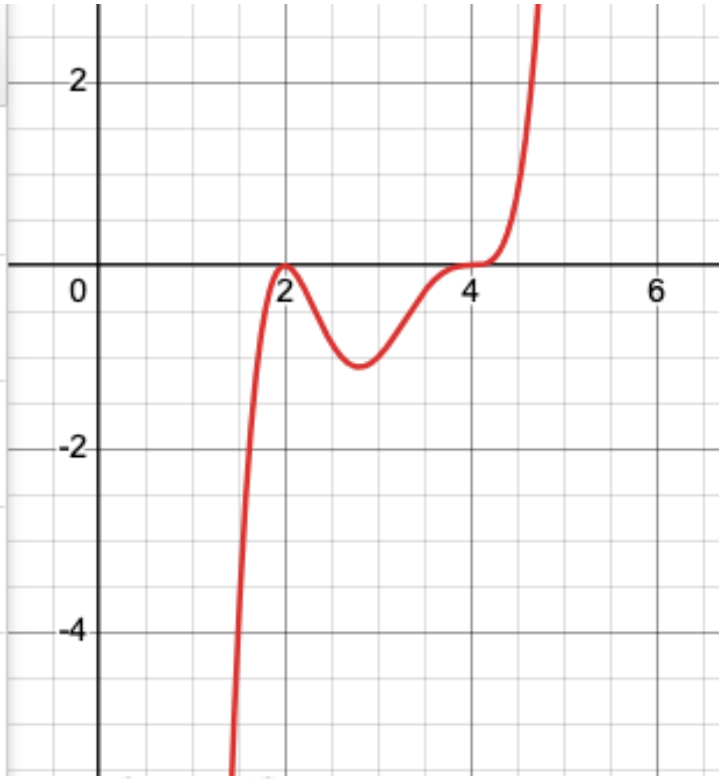


What is a possible function?

2-03 POLYNOMIAL EQUATIONS

What is a possible function?

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



2-03 POLYNOMIAL EQUATIONS

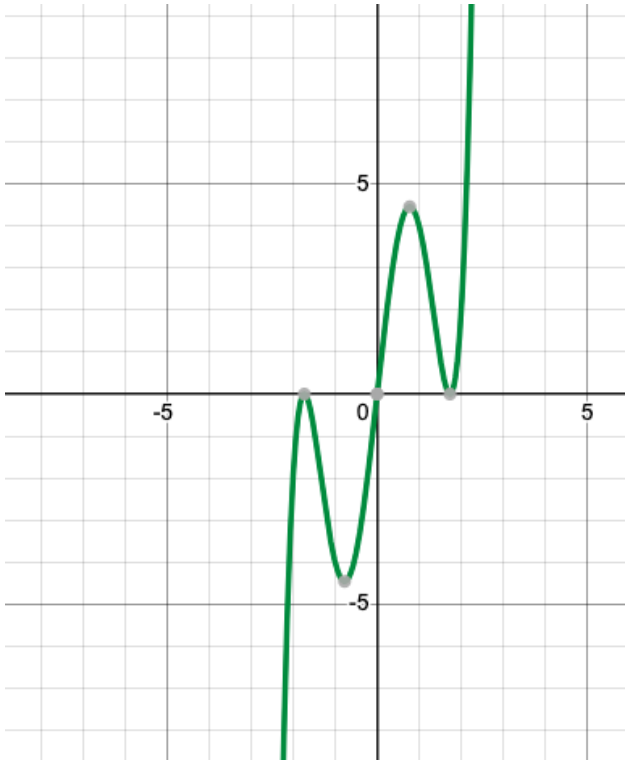
For $g(t) = t^5 - 6t^3 + 9t$

a. Find all zeros

b. Find multiplicity of zeros

c. Graph

$$t(t-\sqrt{3})^2(t+\sqrt{3})^2$$

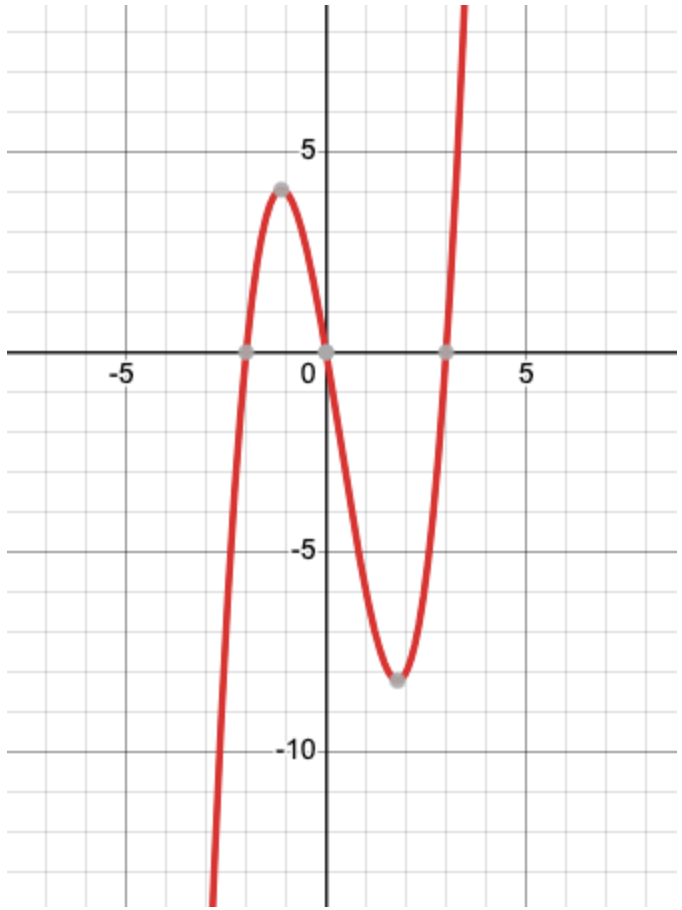


2-03 POLYNOMIAL EQUATIONS

- Find the intercepts of $f(x) = x(x+2)(x-3)$

2-03 POLYNOMIAL EQUATIONS

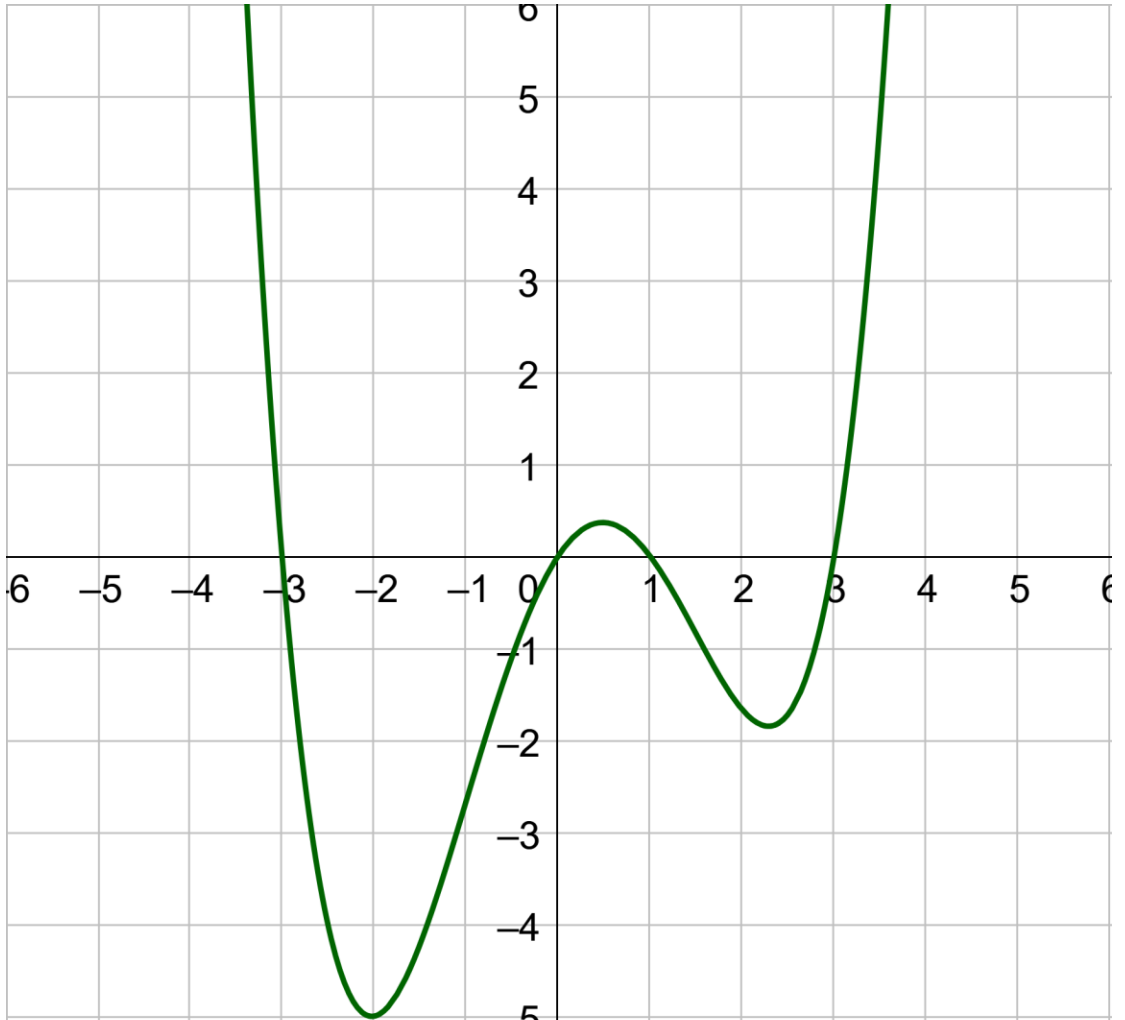
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X=0, -2 , 3

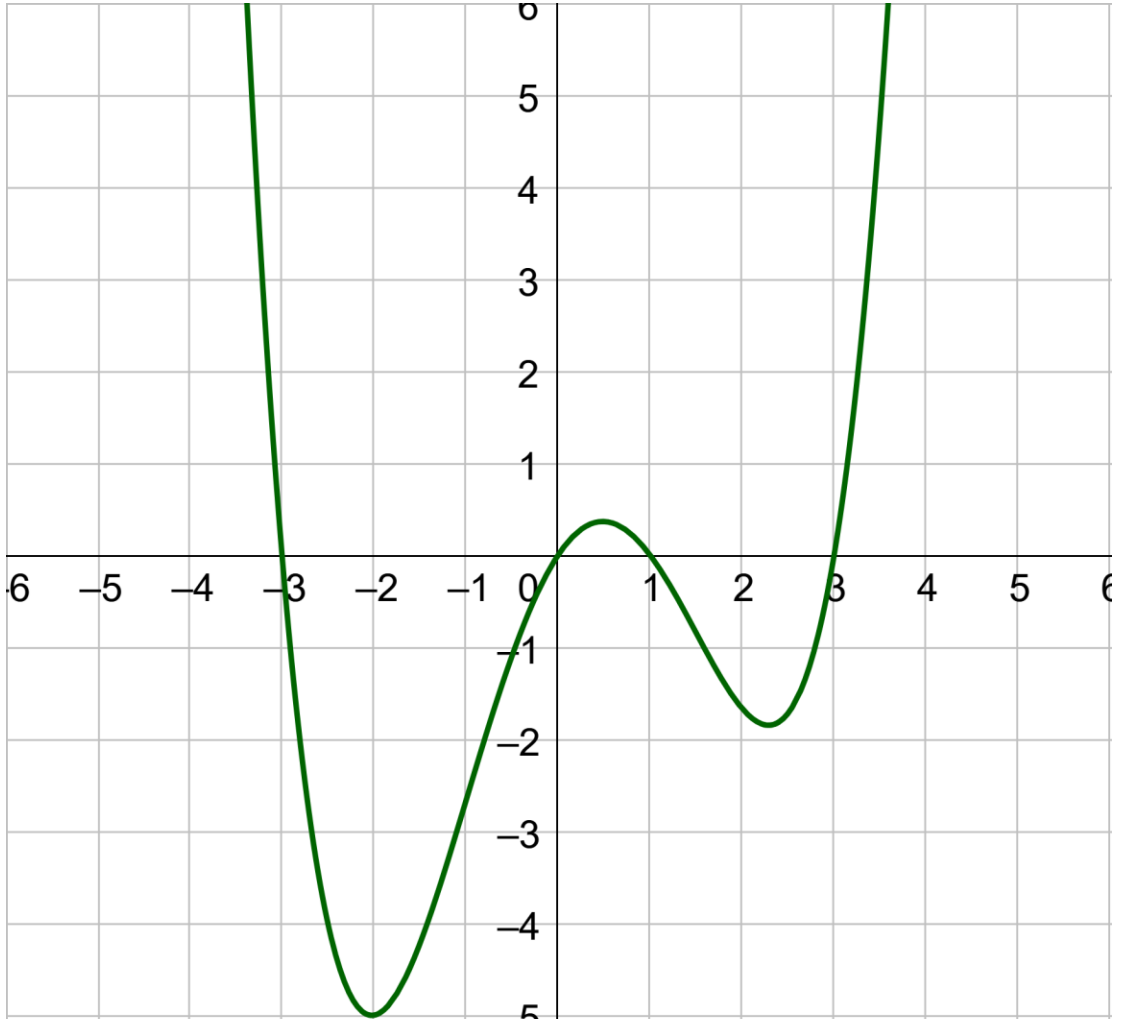
2-03 POLYNOMIAL EQUATIONS

- Determine the least possible degree of the polynomial function shown.



2-03 POLYNOMIAL EQUATIONS

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4

TRUE OR FALSE

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FALSE

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TRUE

Instructions: Use the information in the table below to answer each question. Show reasoning where required.

Interval	$(-\infty,-2)$	$(-2, 1)$	$(1, 4)$	$(4, \infty)$
Value of $h(x)$	Positive	Negative	Positive	Positive

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(d) Determine whether the leading coefficient of h is positive or negative, and explain.

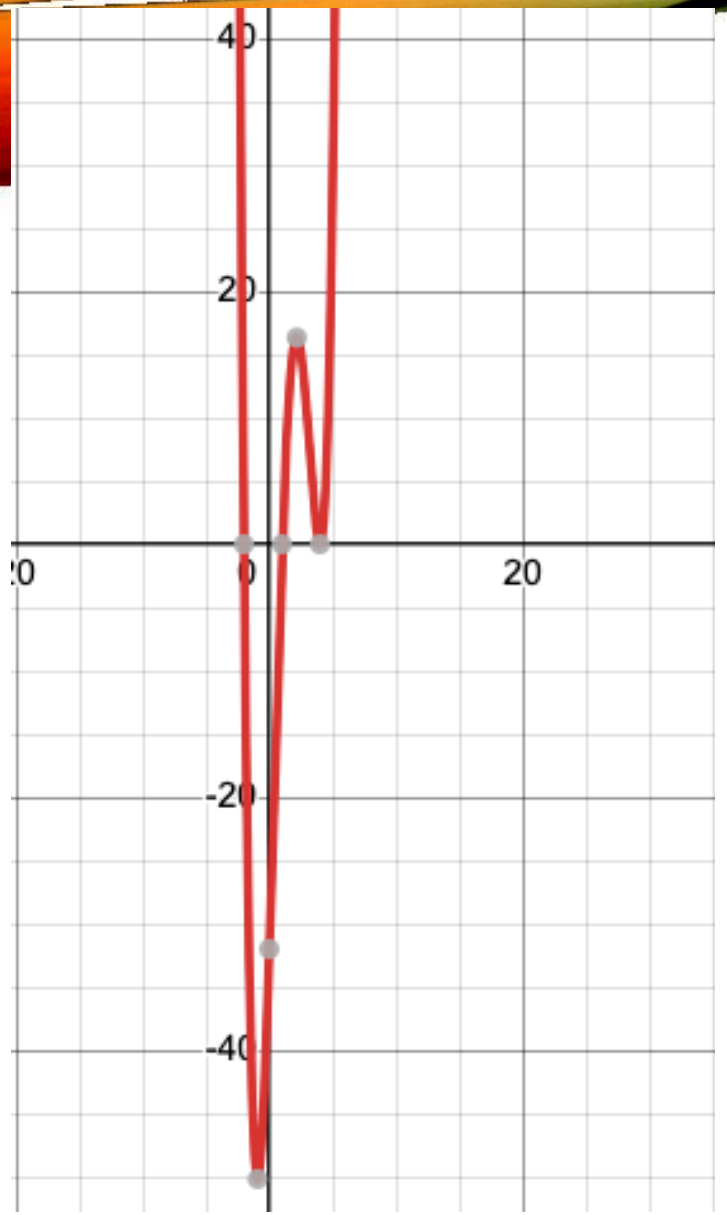


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40
20
0
20
-20
-40