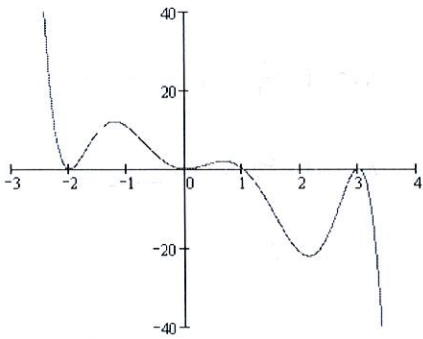


Based on the graph, answer the question below:



1. What must the least possible degree be? Give two reasons as to how you know (bullet points).

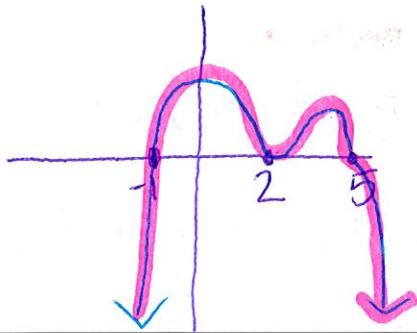
Least possible degree? 7

- End behavior opposite, so odd degree.
- 6 extrema  $\rightarrow$  add 1.

2. What would the range be of a 9<sup>th</sup> degree polynomial?

$(-\infty, \infty)$

3. Give an example of a graph that has the following solutions:  $x = -1$ ;  $x = 2, 2$ ; and  $x = 5, 5, 5$



goes through  $\uparrow$  bounce  $\uparrow$  goes through  $x^6$

If  $f(2) = 3$ ,  $f(-2) = 0$  and  $f(0) = 4$ , then answer questions 4 - 5  $\leftarrow (0, 4)$  y-intercept!!

4. If we divide by  $x - 2$ , then what is the remainder?

2

Remainder = 3

5. What is a factor we know?

$f(-2) = 0$

$(x + 2)$  factor

6. Solve by factoring  $8x^3 - 64 = 0$   $a = 2x$   $b = 4$   
 $8(x^3 - 8) = 0$   $a = x$   $b = 2$

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

$x - 2 = 0$   
 $x = 2$

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

$x + 1 = \pm i\sqrt{3}$

$x = 2, -1 \pm i\sqrt{3}$

7. Find all roots and write them as **linear factors**

$$f(x) = x^4 + x^3 + 2x^2 + 4x - 8$$

table: -2, 1

$$\begin{array}{r|rrrrr} -2 & 1 & 1 & 2 & 4 & -8 \\ & \downarrow & -2 & 2 & -8 & 8 \\ \hline & 1 & -1 & 4 & -4 & 0 \\ & \downarrow & 1 & 0 & 4 & \\ \hline & 1 & 0 & 4 & 0 & \end{array}$$

$$x^2 + 4 = 0$$

$$(x+2i)(x-2i)$$

$$(x+2)(x-1)(x+2i)(x-2i)$$

8. Find all **x-intercepts**  $f(x) = x^4 + 4x^3 + x^2$

$$x^2(x^2 + 4x + 1)$$

$$x^2 = 0$$

$$x^2 + 4x + 1 = 0$$

$$x^2 + 4x + \underline{4} = -1 + \underline{4}$$

$$\sqrt{(x+2)^2} = \sqrt{3}$$

$$x+2 = \pm\sqrt{3}$$

$$x = -2 \pm \sqrt{3}$$

$$(0,0)(0,0)(-2+\sqrt{3},0)(-2-\sqrt{3},0)$$

9. Find all **roots**  $f(x) = x^3 + 6x^2 - 6x - 1$

table: 1

$$\begin{array}{r|rrrr} & 1 & 6 & -6 & -1 \\ & & 1 & 7 & 1 \\ \hline & 1 & 7 & 1 & 0 \end{array}$$

$$x^2 + 7x + 1 = 0$$

$$x = \frac{-7 \pm \sqrt{49 - 4(1)(1)}}{2} = \frac{-7 \pm \sqrt{45}}{2}$$

$$x = 1, -\frac{7}{2} \pm \frac{3\sqrt{5}}{2}$$

10. Find all the **solutions**  $x^3 - 5x^2 = -3x + 15$

$$x^3 - 5x^2 + 3x - 15 = 0$$

$$x^2(x-5) + 3(x-5) = 0$$

$$(x^2 + 3)(x-5) = 0$$

$$x^2 + 3 = 0$$

$$x-5 = 0$$

$$x^2 = -3$$

$$x = 5$$

$$x = \pm i\sqrt{3}$$

$$x = 5, \pm i\sqrt{3}$$