rewrite f(x) in factored form and find all zeros. Then sketch the graph. Show all work.

① $f(x) = x^4 - 4x^3 - 6x^2 + 36x - 27$ has a factor of $(x-3)$ with multiplicity two.

$$\frac{\cancel{(x-3)}\cancel{(x-3)}(\quad)(\quad)}{\cancel{(x-3)}\cancel{(x-3)}} = \frac{x^4 - 4x^3 - 6x^2 + 36x - 27}{(x-3)(x-3)}$$

3	1	−4	−6	36	−27
	↓	3	−3	−27	27
3	1	−1	−9	9	0
		3	6	−9	
	1	2	−3	0	
	x^2	x	C	R	

$(x+3)(x-1) = x^2 + 2x - 3$

−3, 3, −1, 2

The **fully factored form** of f(x) is: $\underbrace{(x-3)(x-3)}(x+3)(x-1)$

$(x-3)^2(x+3)(x-1)$

The **zeros** are:

Zeros
$x-3=0$ $x-3=0$ $x+3=0$ $x-1=0$
$\underbrace{x=3 \quad x=3}_{\text{mult2}}$ $x=-3$ $x=1$

$x=3$; mult2 $x=-3$ $x=1$

The **x-intercepts** are:
$(3,0)$ $(-3,0)$ $(1,0)$

The **y-intercept** of the polynomial is
$(0,-27)$

y-int
$f(0) = (0)^4 - 4(0)^3 - 6(0)^2 + 36(0) - 27$

: The **end behavior** of the polynomial is…

if $x \to \infty$ then $y \to$ ∞

if $x \to -\infty$ then $y \to$ ∞

graph next page

② $f(x) = 2x^3 - 3x^2 - 14x + 15$ has factors of $(x-1)$ and $(x-3)$.

$$\frac{\cancel{(x-1)}\cancel{(x-3)}(\ ?\ )}{\cancel{(x-1)}\cancel{(x-3)}} = \frac{2x^3 - 3x^2 - 14x + 15}{(x-1)(x-3)}$$

1	2	−3	−14	15
	↓	2	−1	−15
3	2	−1	−15	
	↓	6	15	
	2	5	0	
	x	C	R	

$(\ ?\ ) = (2x+5)$

The **fully factored form** of f(x) is: $(x-1)(x-3)(2x+5)$

The **zeros** are: $x=1$ $x=3$ $x=-2.5$

Zeros
$x-1=0$ $x-3=0$ $2x+5=0$
$x=1$ $x=3$ $x=-2.5$

The **x-intercepts** are: $(1,0)$ $(3,0)$ $(-2.5,0)$

The **y-intercept** of the polynomial is
$(0,15)$

y-int
$f(0) = 2(0)^3 - 3(0)^2 - 14(0) + 15$

: The **end behavior** of the polynomial is…

if $x \to \infty$ then $y \to$ ∞

if $x \to -\infty$ then $y \to$ $-\infty$

graph next page

③ $f(x) = -x^5 + 7x^4 - 9x^3 - 27x^2 + 54x$ has a factor of $(x-3)$ with multiplicity 3.

$$\frac{\cancel{(x-3)}\cancel{(x-3)}\cancel{(x-3)}(\quad)(\quad)}{\cancel{(x-3)}\cancel{(x-3)}\cancel{(x-3)}} = \frac{-x^5 + 7x^4 - 9x^3 - 27x^2 + 54x + 0}{(x-3)(x-3)(x-3)}$$

3	−1	7	−9	−27	54	0
	↓	−3	12	9	−54	
3	−1	4	3	−18	0	0
	↓	−3	3	18		
3	−1	1	6	0		
	↓	−3	−6			
	−1	−2	0			
	x^2	x	c			

$-x^2 - 2x \rightarrow -x(x-2)$

The **fully factored form** of f(x) is:
$-x(x-2)(x-3)(x-3)(x-3) \longrightarrow -x(x-2)(x-3)^3$

The **zeros** are:
$x=0$ $x=2$ $x=3$; mult3

Zeros
$-x=0$ $x-2=0$ $x-3=0$ $x-3=0$ $x-3=0$
$x=0$ $x=2$ $\underbrace{x=3 \quad x=3 \quad x=3}_{\text{mult3}}$

The **x-intercepts** are:
$(0,0)$ $(2,0)$ $(3,0)$

The **y-intercept** of the polynomial is
$(0,0)$

y-int
$f(0) = -(0)^5 + 7(0)^4 - 9(0)^3 - 27(0)^2 + 54(0)$

: The **end behavior** of the polynomial is…

if $x \to \infty$ then $y \to$ $-\infty$

if $x \to -\infty$ then $y \to$ ∞

graph next page

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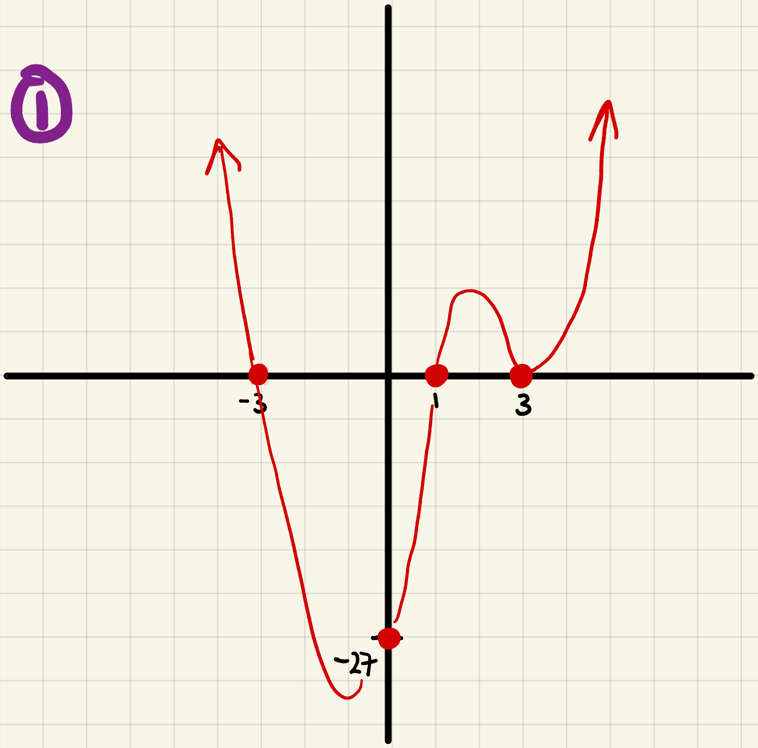

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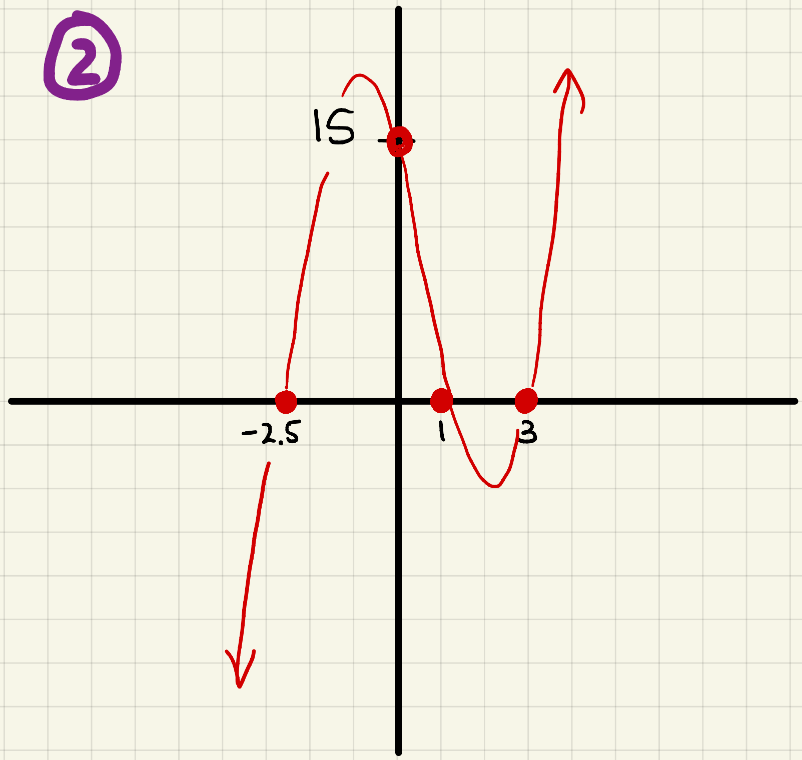

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