Solutions

2.1 Zeros and Multiplicity

2.1.1. List zeros and multiplicities of $(x-4)^3(x+1)^2$.

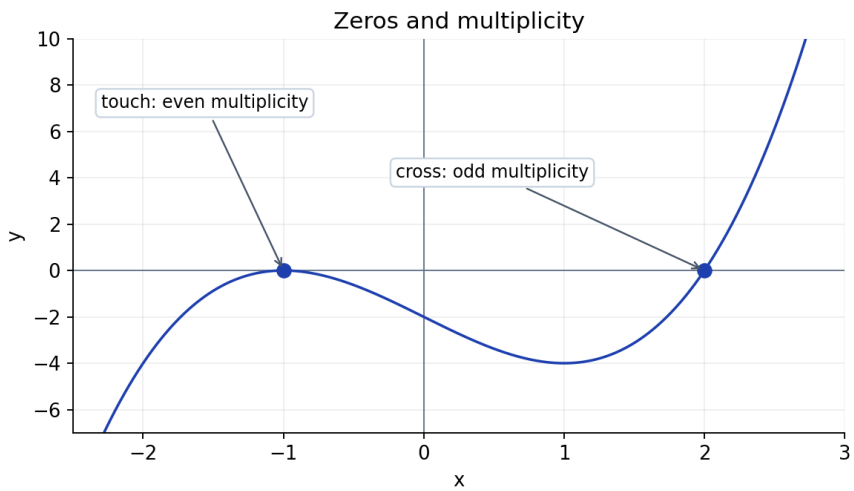
Solution. 4 has multiplicity 3 and -1 has multiplicity 2. The graph crosses at 4 and touches at -1.

2.1.2. Write a monic quadratic with zeros -2 and 5.

Solution. $f(x)=(x+2)(x-5)=x^2-3x-10$.

2.1.3. Use the graph of $y=(x+1)^2(x-2)$ to describe its zeros and whether it crosses or touches.

Solution. The zero -1 has multiplicity 2 and touches the axis. The zero 2 has multiplicity 1 and crosses.



−1 has multiplicity 2; 2 has multiplicity 1.

Solutions

2.2 End Behavior

2.2.1. Describe the ends of $f(x) = 5x^6 - x^2 + 2$.

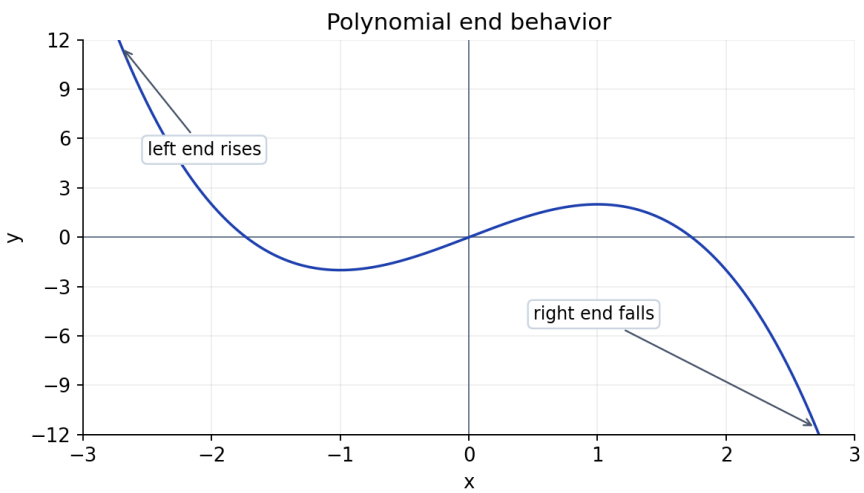
Solution. The degree is even and the leading coefficient is positive, so both ends rise toward ∞.

2.2.2. Describe the ends of $g(x) = -x^5 + 2x^2$.

Solution. The negative odd-degree leading term makes the left end rise and the right end fall.

2.2.3. Use the graph of $y = -x^3 + 3x$ to identify its end behavior.

Solution. The negative cubic leading term means $y \to \infty$ as $x \to -\infty$, and $y \to -\infty$ as $x \to \infty$.



The left end tends to positive infinity; the right end tends to negative infinity.

Solutions

2.3 Complex Solutions

2.3.1. Solve $x^2 + 4 = 0$.

Solution. $x^2 = -4$, so $x = \pm 2i$.

2.3.2. Simplify $(3 + 2i) + (1 - 5i)$.

Solution. Combine real and imaginary parts: $4 - 3i$.

2.3.3. Multiply $(2 + i)(2 - i)$.

Solution. The product is $4 - i^2 = 5$. Complex conjugates have a real product.

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