



Precalculus

Topic: Polynomial Functions and Their Graphs

Instructions

Solve the following problems related to polynomial functions and their graphs. Show all work clearly and check your solutions.

Practice Problems

1. Sketch the graph of the polynomial function. Make sure your graph shows all intercepts and exhibits the proper end behavior.

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

(ii) $P(x) = x(x - 3)(x + 2)$

(iii) $P(x) = (2x - 1)(x + 1)(x + 3)$

(iv) $P(x) = (x - 5)^2(x + 2)(x - 1)$

(v) $P(x) = \frac{1}{2}(x + 1)(x - 3)$

(vi) $P(x) = (x - 2)^3(x + 3)$

(vii) $P(x) = (x + 1)(x - 2)(x - 3)$

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

2. Factor the polynomial and use the factored form to find the zeros. Then sketch the graph.

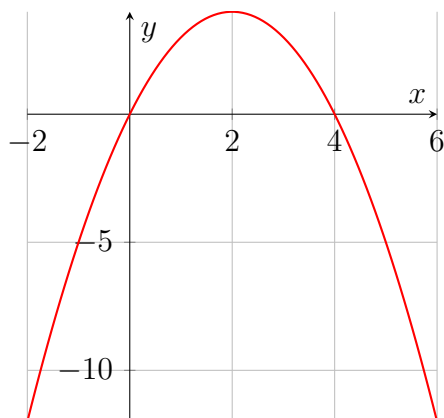
(i) $P(x) = x^3 - x^2 - 6x$

(ii) $P(x) = x^3 - 8x^2 - 12x$

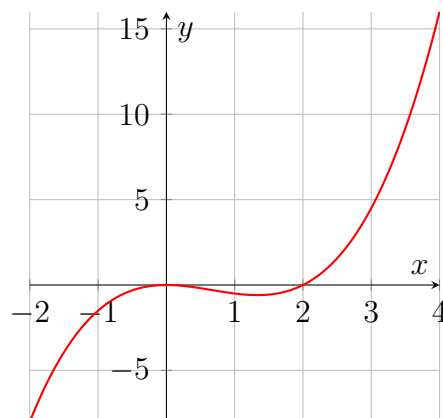
(iii) $P(x) = x^4 - 12x^3 + 12x^2$

- (iv) $P(x) = 4x^2 - 12x + 9$
- (v) $P(x) = x^3 + 4x^2 + x + 4$
- (vi) $P(x) = x^5 - 9x^3 + 4x$
- (vii) $P(x) = 3x^4 - 9x^3 + 6x^2 - 18x$

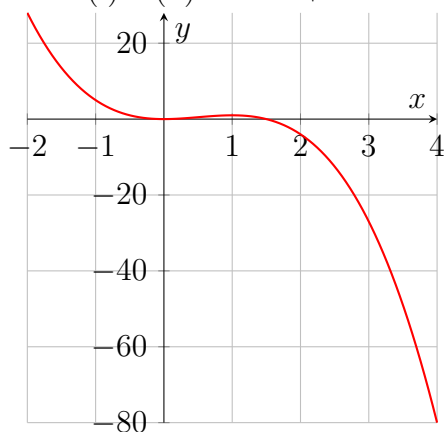
3. The graph of a polynomial function is given. From the graph, find: (a) the x- and y-intercepts, and (b) the coordinates of all local extrema.



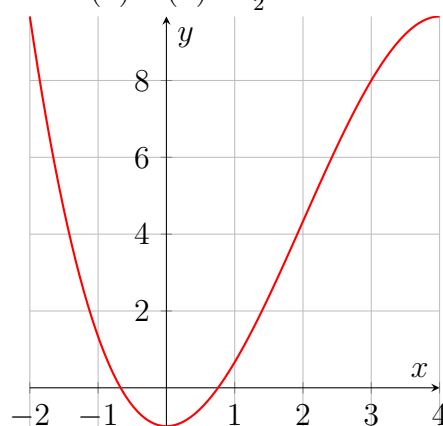
(i) $P(x) = -x^2 + 4x$



(ii) $P(x) = \frac{1}{2}x^3 - x^2$



(iii) $P(x) = 3x^2 - 2x^3$



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

4. For the following polynomials, determine the degree and end behavior. Then, sketch the graph.

- (i) $P(x) = x^5 - 2x^3 + 3x^2 - x$
- (ii) $P(x) = -2x^4 + 5x^2 - 3$
- (iii) $P(x) = x^6 - 4x^4 + 6x^2 - 2$
- (iv) $P(x) = 3x^3 - 2x^2 + x$
- (v) $P(x) = -x^4 + 6x^2 - 2x + 4$

Multiple-Choice Questions

1. What is the degree of the polynomial $P(x) = x^4 - 5x^3 + 2x^2 - 3x + 1$?

- A. 1

- B. 2
 - C. 3
 - D. 4
2. What are the zeros of the polynomial $P(x) = x^2 - 4x + 4$?
- A. $x = 2, 2$
 - B. $x = -2, 2$
 - C. $x = -1, 1$
 - D. $x = 0, 4$
3. The degree of the polynomial $P(x) = -2x^4 + 5x^2 - 3$ is:
- A. 1
 - B. 2
 - C. 3
 - D. 4
4. What is the end behavior of the polynomial $P(x) = -x^3 + 5x^2 - x + 2$?
- A. Left goes up, right goes down
 - B. Left goes down, right goes up
 - C. Both ends go down
 - D. Both ends go up
5. What are the multiplicities of the zeros of the polynomial $P(x) = (x + 2)^2(x - 1)(x - 3)^3$?
- A. $x = -2, 1, 3$
 - B. $x = -2, 1, 3^2$
 - C. $x = -2^2, 1, 3$
 - D. $x = -2, 1^2, 3^3$

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