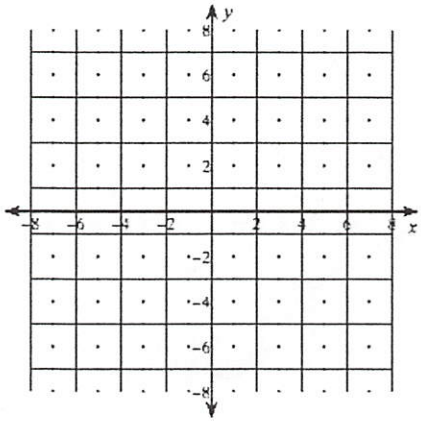
Notes Section 4.1

Graphing Polynomial Functions:

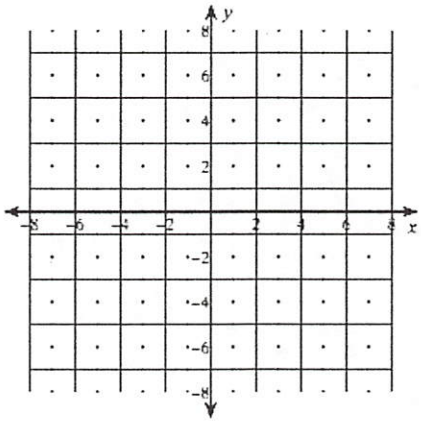
- Using the End Behavior
- Using the x-intercepts (zeros)
- Using the y-intercepts
- Using test points

1-10 Sketch the graph of the function by transforming the graph of an appropriate function of the form $y = x^n$. Indicate all x- and y-intercepts on each graph.

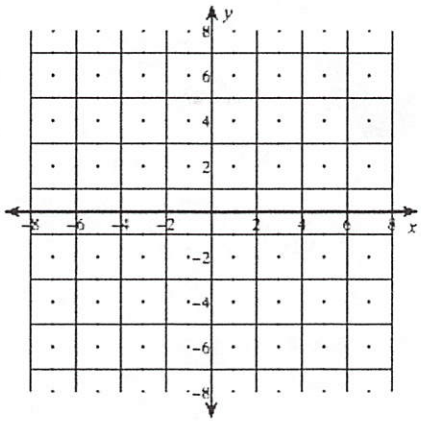
2. $P(x) = -x^3 + 8$



4. $P(x) = 2(x-1)^3$

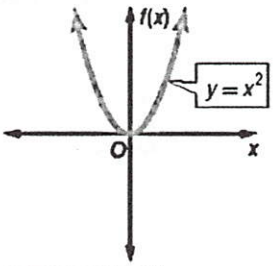


8. $P(x) = (x+2)^4 - 1$

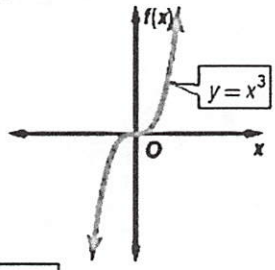


End Behavior of a Polynomial Function

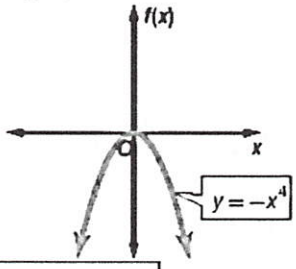
Degree: even
Leading Coefficient: positive
End Behavior:



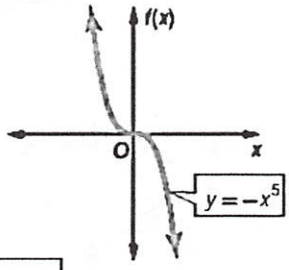
Degree: odd
Leading Coefficient: positive
End Behavior:



Degree: even
Leading Coefficient: negative
End Behavior:



Degree: odd
Leading Coefficient: negative
End Behavior:



Real Zeros of Polynomials

If P is a polynomial and c is a real number, then the following are equivalent.

1.

2.

3.

4.

Guidelines for Graphing Polynomial Functions:

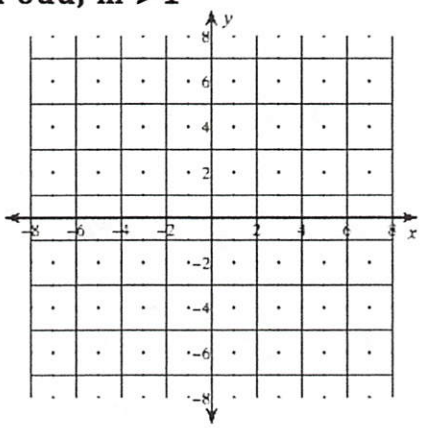
1. Zeros
2. Test Points
3. End Behavior
4. Graph

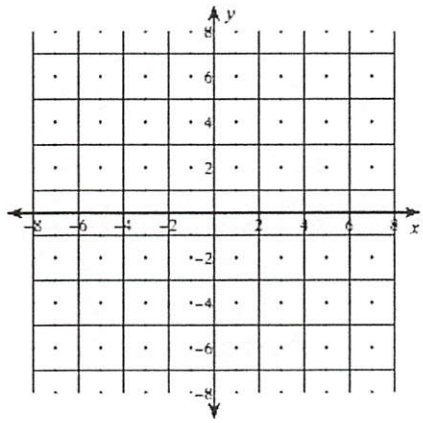
Shape of the Graph Near a Zero of Multiplicity m

Suppose that *c* is a zero of *P(x)* of multiplicity *m.* Then the shape of the graph of *P(x)* near *c* is as follows:

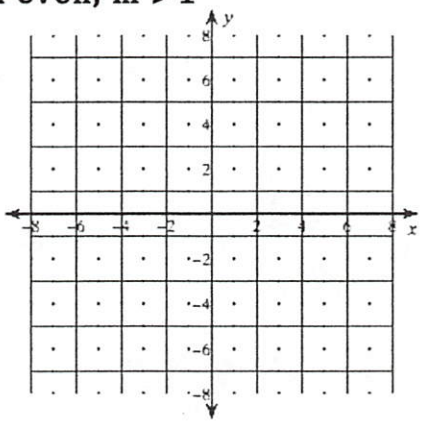
Multiplicity of c | Shape of the graph of *P(x)* near the *x-intercept c.*

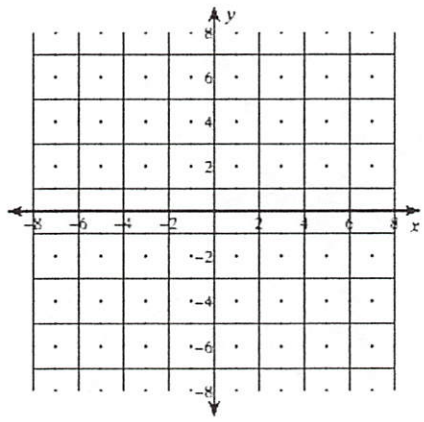
m odd, m >1





m even, m >1





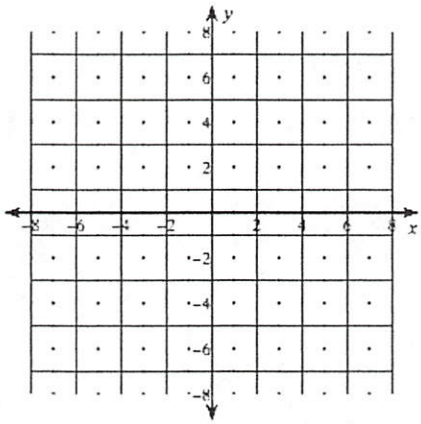
11-16 Match the polynomial function with one of the graphs I-VI. Give reasons for your choice.

11. $P(x) = x(x^2 - 4)$

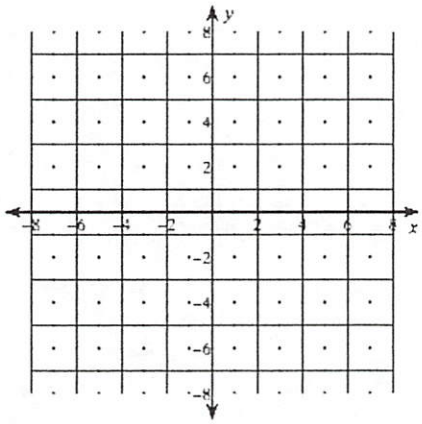
13. $P(x) = -x^5 + 5x^3 - 4x$

17-28 Sketch the graph of the polynomial function. Make sure your graph shows all intercepts and exhibits the proper end behavior.

18. $P(x) = (x-1)(x+1)(x-2)$

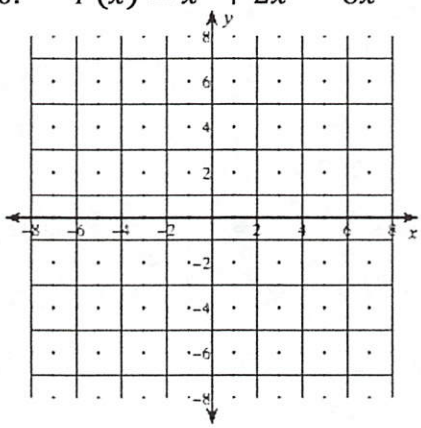


28. $P(x) = (x-3)^2(x+1)^2$

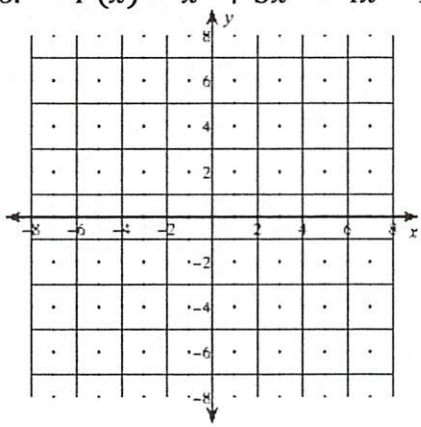


29-42 Factor the polynomial and use the factored form to find the zeros. Then sketch the graph.

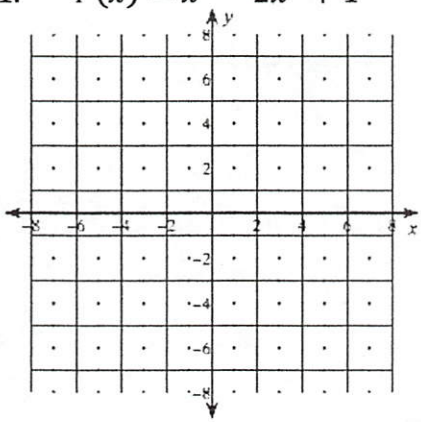
30. $P(x) = x^3 + 2x^2 - 8x$



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

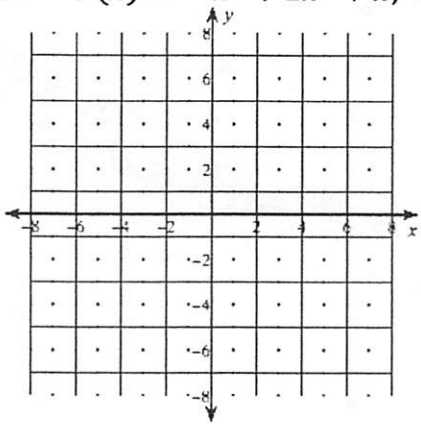


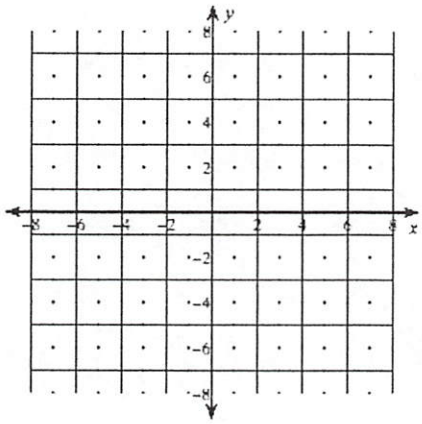
41. $P(x) = x^6 - 2x^3 + 1$



43-48 Determine the end behavior of P. Compare the graphs of P and Q on large and small viewing rectangles, as in example 3(b)

46. $P(x) = -x^5 + 2x^2 + x; \quad Q(x) = -x^5$



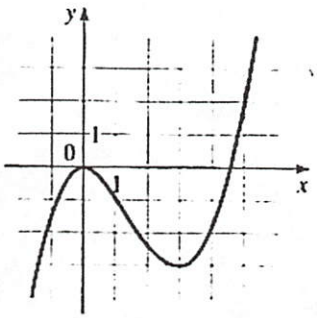


49-52 The graph of a polynomial function is given.

(a) Find the x- and y-intercepts.

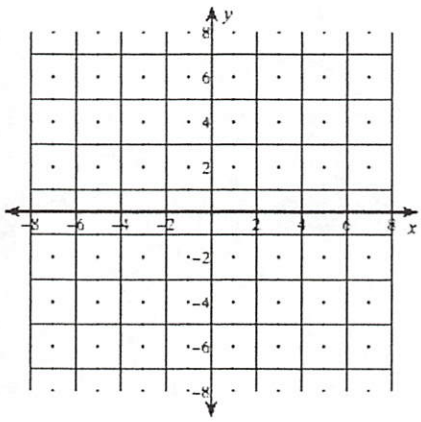
(b) Find the coordinates of all local extrema.

50.



61-70 Graph the polynomial and determine how many local maxima and minima it has.

62. $y = x^3 + 12x$



68. $y = (x^2 - 2)^3$