

State the possible rational zeros of each function.

1)  $f(x) = 3x^3 + 14x^2 - 20x + 5$

5: 1, 5  
3: 1, 3  $\pm 1, \pm \frac{1}{3}, \pm 5, \pm \frac{5}{3}$

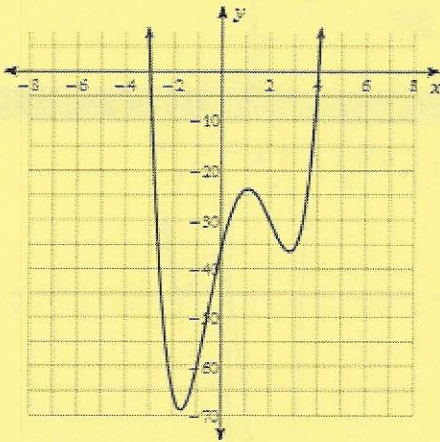
2)  $f(x) = 2x^3 + 8x^2 + x - 14$

14: 1, 2, 7, 14  
2: 1, 2

$\pm 1, \pm \frac{1}{2}, \pm 2, \pm 7, \pm \frac{7}{2}, \pm 14$

Given the graph of the  $f(x)$ , find all zeros and factors of the function.

3)  $f(x) = x^4 - 3x^3 - 7x^2 + 21x - 36$



$$\begin{array}{r} -3 \overline{) 1 \quad -3 \quad -7 \quad 21 \quad -36} \\ \underline{\phantom{-3} 3 \phantom{0} \phantom{0} \phantom{0} \phantom{0}} \\ \phantom{-3} 0 \phantom{0} \phantom{0} \phantom{0} \phantom{0} \end{array}$$

$$\begin{array}{r} 4 \overline{) 1 \quad -6 \quad 11 \quad -12 \quad 0} \\ \underline{\phantom{4} 4 \phantom{0} \phantom{0} \phantom{0}} \\ \phantom{4} 0 \phantom{0} \phantom{0} \phantom{0} \end{array}$$

$$\begin{array}{r} 1 \quad -2 \quad 3 \quad 0 \end{array}$$

$$x^2 - 2x + 3$$

Factors:  $(x+3)(x-4)(x^2-2x+3)$

Zeros: -3, 4

Given the following functions, how many zeros will they have? Do not solve.

4)  $f(x) = x^4 - 2x^3 + 9$

4

5)  $f(x) = x^2 + x - 9$

2

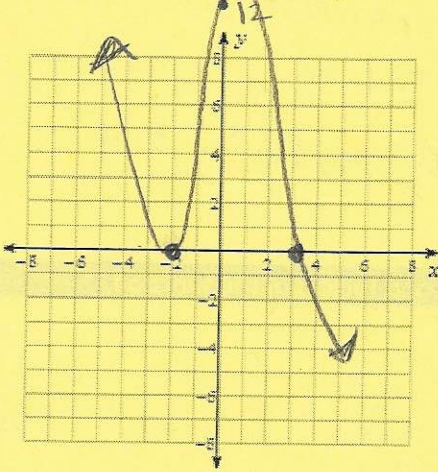
6)  $f(x) = 7x^3 + x - 6$

3

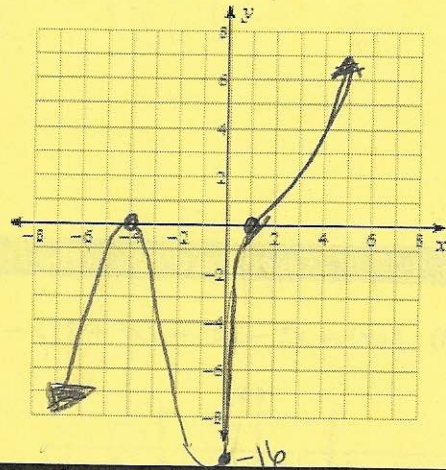


Draw a sketch of the graph using your knowledge of zeros, multiplicity, and end behavior.

7)  $f(x) = -(x+2)^2(x-3)$

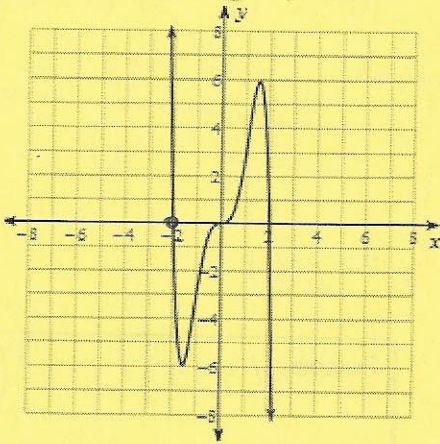


8)  $f(x) = (x-1)^3(x+4)^2$

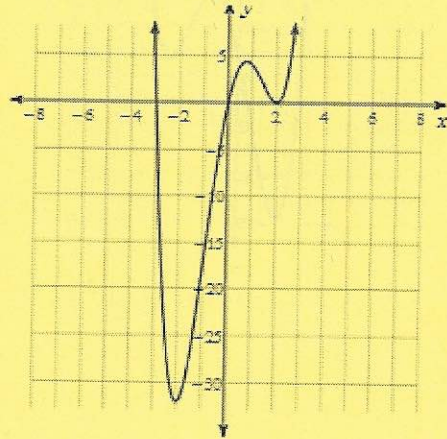


Write a polynomial function for the graph show. Leave in factored form.

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



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



Factor Completely to find the zeros. Then graph.

11)  $f(x) = 2x^4 - 7x^3 + 7x^2 - 2x$

$x(2x^3 - 7x^2 + 7x - 2)$

$$\begin{array}{r} \underline{11} \quad 2 \quad -7 \quad 7 \quad -2 \\ \quad \downarrow \quad 2 \quad -5 \quad 2 \\ \hline 2 \quad -5 \quad 2 \quad 0 \end{array}$$

$2x^2 - 5x + 2$

$2x \quad 1 \quad (2x-1)(x-2)$   
 $x \quad 2$

Factors:  $x(2x-1)(x-2)(x-1)$

Zeros:  $0, \frac{1}{2}, 2, 1$



Write a polynomial of least degree with the given zeros.

12)  $-3, 4, 2$  - multiplicity 2

$$(x+3)(x-4)(x-2)^2$$

13)  $0, -2, 5$

$$x(x+2)(x-5)$$

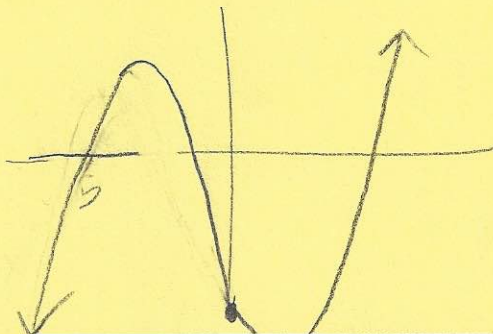
Find all factors and zeros of the following polynomials. Then graph.

14)  $f(x) = x^3 - 4x^2 - 50x - 25$

$$\begin{array}{r|rrrr} -5 & 1 & -4 & -50 & -25 \\ & \downarrow & -5 & 45 & 25 \\ \hline & 1 & -9 & -5 & 0 \end{array}$$

$$x^2 - 9x - 5$$

$$x = \frac{9 \pm \sqrt{81 - 4(-5)}}{2}$$



Factors:  $(x+5)(x^2 - 9x - 5)$

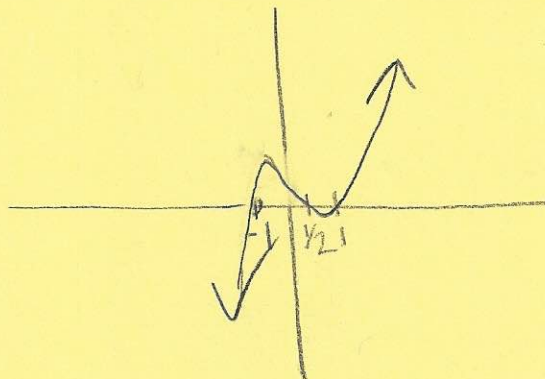
Zeros:  $-5$  2 complex

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

$$\begin{array}{r|rrrr} -1 & 2 & -1 & -2 & 1 \\ & \downarrow & -2 & 3 & -1 \\ \hline & 2 & -3 & 1 & 0 \end{array}$$

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

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



Factors:  $(x+1)(2x-1)(x-1)$

Zeros:  $-1, \frac{1}{2}, 1$

$$\begin{array}{l} 2x-1 \quad x \\ x-1 \quad 2x \end{array}$$