

Find the zeros of the polynomial WITHOUT a calculator.

1.  $f(x) = x^3 + 2x^2 - 11x - 12$   $\pm 1, 2, 3, 4, 6, 12$       2.  $f(x) = x^3 + 3x^2 + 2x$

$$\begin{array}{r|rrrr} -4 & 1 & 2 & -11 & -12 \\ & & -4 & 8 & 12 \\ \hline & 1 & -2 & -3 & 0 \end{array}$$

$$(x+4)(x-3)(x+1) = 0$$

$$x = -4, 3, -1$$

$$x(x^2 + 3x + 2) = 0$$

$$x(x+2)(x+1) = 0$$

$$x = 0, -1, -2$$

3.  $f(x) = x^3 - 2x^2 - 5x + 6$   $\pm 1, 2, 3, 6$

$$\begin{array}{r|rrrr} -2 & 1 & -2 & -5 & 6 \\ & & -2 & +8 & -6 \\ \hline & 1 & -4 & 3 & 0 \end{array}$$

$$(x+2)(x-3)(x-1) = 0$$

$$x = -2, 3, 1$$

4.  $f(x) = x^3 + 9x^2 + 26x + 24$   $\pm 1, 2, 3, 4, 6, 8, 12, 24$

$$\begin{array}{r|rrrr} -4 & 1 & 9 & 26 & 24 \\ & & -4 & -20 & -24 \\ \hline & 1 & 5 & 6 & 0 \end{array}$$

$$(x+4)(x+2)(x+3) = 0$$

$$x = -4, -2, -3$$

Determine the zeros and multiplicity of each zero and state the end behavior.

5.  $f(x) = (x-5)(x-4)(x+1)$

$x = 5$  mult 1  
 $x = 4$  mult 1  
 $x = -1$  mult 1

6.  $f(x) = (x-1)^2(x-5)^3(x+3)$

$x = 1$  mult 2  
 $x = 5$  mult 3  
 $x = -3$  mult 1

7.  $f(x) = -(x+4)(x+1)^2$

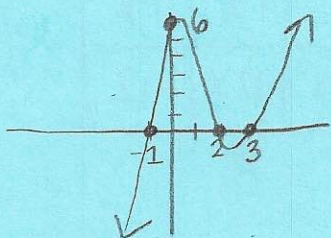
$x = -4$  mult 1  
 $x = -1$  mult 2

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

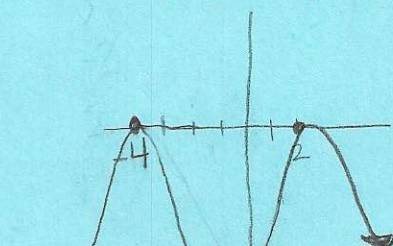
$x = 0$  mult 1  
 $x = -2$  mult 2  
 $x = 2$  mult 3

Sketch a graph of the polynomial function.

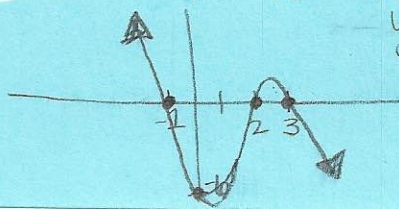
9.  $f(x) = (x-3)(x+1)(x-2)$  y-intercept  $(-3)(1)(-2) = 6$



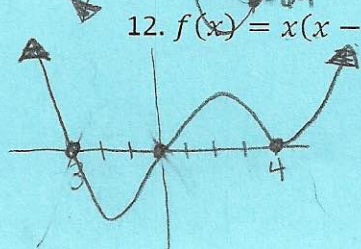
10.  $f(x) = -(x-2)^2(x+4)^2$  y-intercept  $-(4)(16) = -64$



11.  $f(x) = -(x+1)(x-2)(x-3)$  y-intercept  $-(1)(-2)(-3) = -6$

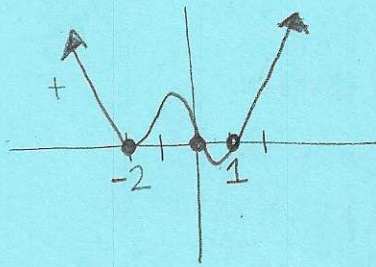


12.  $f(x) = x(x-4)^2(x+3)$  y-intercept

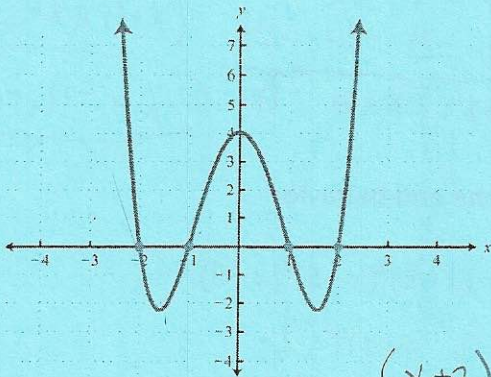




13.  $f(x) = x(x+2)^2(x-1)$  y-intercept 0



12. Identify the zeros and the multiplicity of each zero. Then write a polynomial from the graph.



- $x = -2$  mult. 2
- $x = -1$  mult. 1
- $x = 1$  mult. 1
- $x = 2$  mult. 1

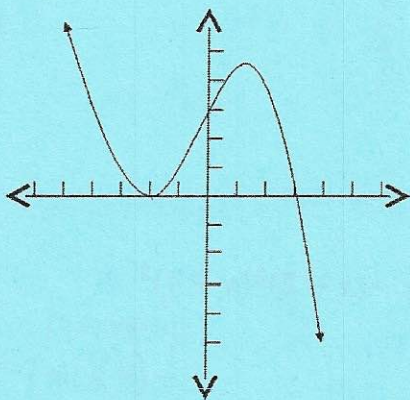
$$(x+2)(x+1)(x-1)(x-2)$$

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

$$x^4 - 5x^2 + 4$$

	$x^2$	$-3x$	$2$
$x^2$	$x^4$	$-3x^3$	$2x^2$
$3x$	$3x^3$	$-9x^2$	$6x$
$2$	$2x^2$	$-6x$	$4$

13. Write a polynomial from the graph.



- $x = -2$  mult. 2
- $x = 3$  mult. 1

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

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

$$x^3 + x^2 - 8x - 12$$

	$x^2$	$4x$	$4$
$x$	$x^3$	$4x^2$	$4x$
$-3$	$-3x^2$	$-12x$	$-12$