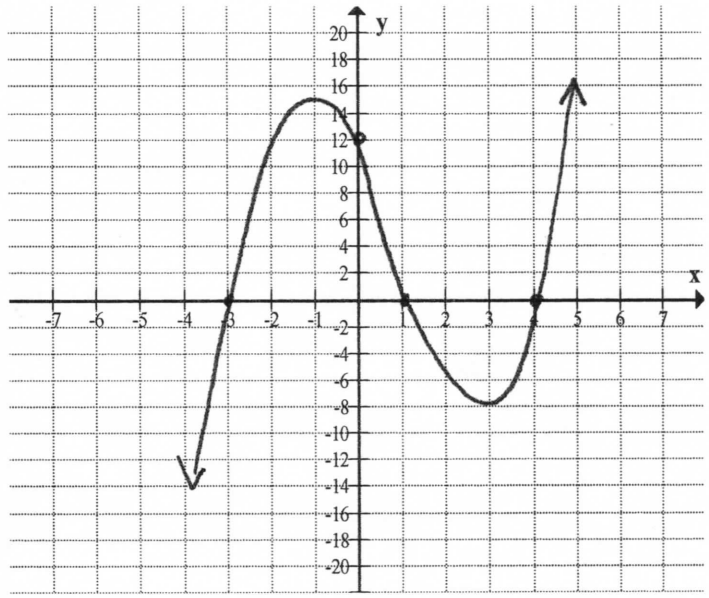
Practice Worksheet 8.4 **Graphing Polynomial Functions in Factored Form**
Algebra 2

For each polynomial function give below, do the following:

a) Identify the leading term and determine the graph's end behavior
b) Find the zeros the polynomial and identify their multiplicities
c) Find the polynomial's y – intercept by substituting in $x = 0$
d) Construct a sketch of the graph of the polynomial function utilizing your knowledge of end-behavior, zeros, and multiplicities

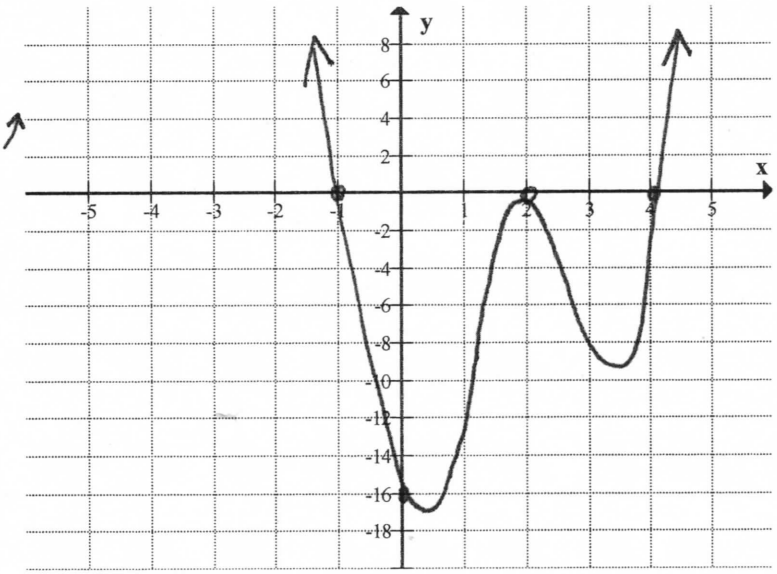
1. $f(x) = (x-4)(x-1)(x+3)$

Leading Term	End-Behavior		
$x \cdot x \cdot x = x^3$	as $x \to \infty$, $y \to \infty$ $x \to -\infty$, $y \to -\infty$		
Zeros	4	1	-3
Multiplicities	1	1	1
Y-intercept (0,12)	$(0-4)(0-1)(0+3)$ $= -4(-1)(3)$ $= 12$		



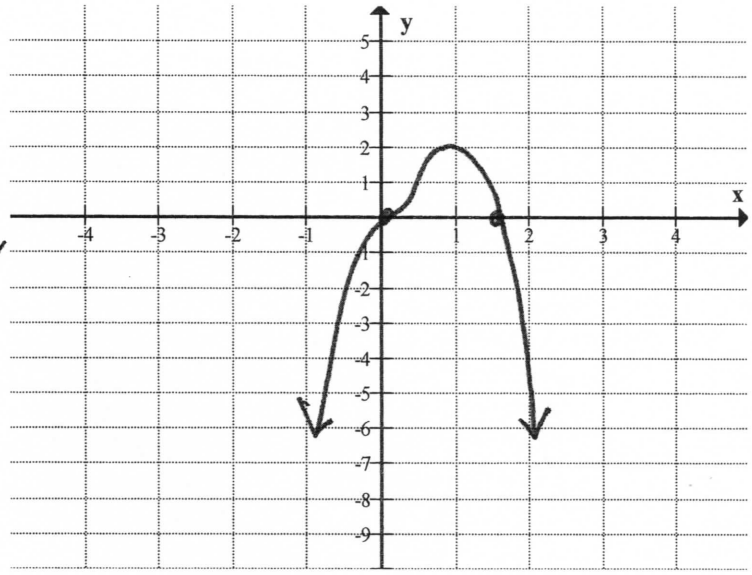
2. $g(x) = (x+1)(x-2)^2(x-4)$

Leading Term	End-Behavior		
$x \cdot x^2 \cdot x = x^4$	as $x \to \infty$, $y \to \infty$ $x \to -\infty$, $y \to \infty$		
Zeros	-1	2	4
Multiplicities	1	2	1
Y-intercept (0,-16)	$(1)(-2)^2(-4)$ $= -16$		



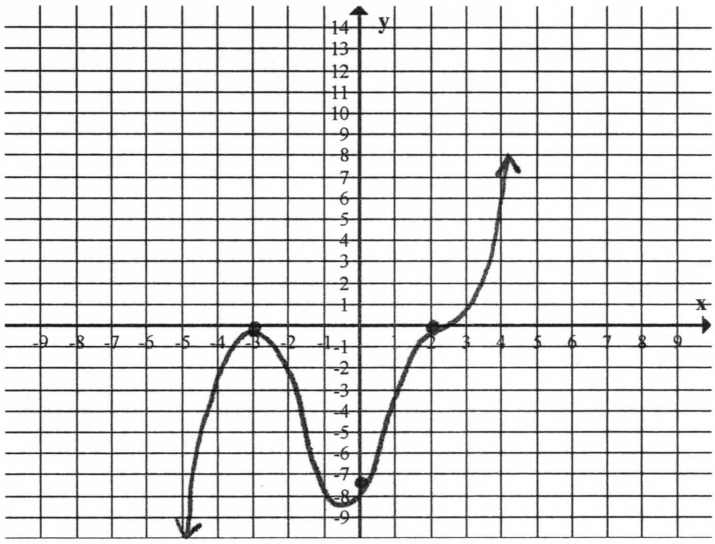
3. $g(x) = -x^3(2x-3)$

Leading Term	End-Behavior	
$-x^3(2x) = -2x^4$	as $x \to \infty$, $y \to -\infty$ $x \to -\infty$, $y \to -\infty$	
Zeros	0	3/2
Multiplicities	3	1
Y-intercept (0,0)	0	



4. $f(x) = \frac{1}{10}(x-2)^3(x+3)^2$

Leading Term	End-Behavior	
$\frac{1}{10}x^3 \cdot x^2 = \frac{1}{10}x^5$	as $x \to \infty$, $y \to \infty$ $x \to -\infty$, $y \to -\infty$	
Zeros	2	-3
Multiplicities	3	2
Y-intercept (0, -7.2)	$\frac{1}{10}(-2)^3(3)^2$ $= -7.2$	



Use synthetic division to determine the values of $f(-1)$ for each function given below.
Is -1 a zero for the polynomial ?

5. $f(x) = x^3 + 3x^2 - 5x - 4$

-1	1	3	-5	-4
		-1	-2	7
	1	2	-7	3

$f(-1) = 3$ / -1 is not a zero of $f(x)$

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

-1	1	1	-3	-3
		-1	0	3
	1	0	-3	0

$f(-1) = 0$

-1 is a zero of $f(x)$

Use synthetic division to determine whether or not the given binomial is a factor of the polynomial. If the binomial is a factor, find the polynomial's remaining factors.

7. $x-1;\ 2x^3+17x^2+23x-42$

1	2	17	23	-42
		2	19	42
	2	19	42	0 = R

$2x^3+17x^2+23x-42$
$= (2x^2+19x+42)(x-1)$
$= (2x+7)(x+6)(x-1)$

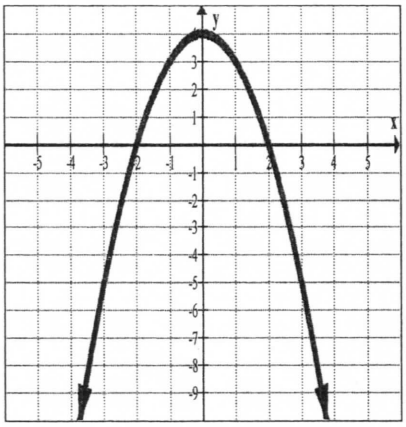
8. $x+1;\ x^4+2x^3+2x^2-2x-5$

-1	1	2	2	-2	-5
		-1	-1	-1	3
	1	1	1	-3	-2

(x+1) is <u>not</u> a factor.

For each graph below, determine whether the degree of the polynomial is even or odd; determine the number of real zeros that it has and state them; and, make statements that describe the function's end behavior.

9.



Degree: even

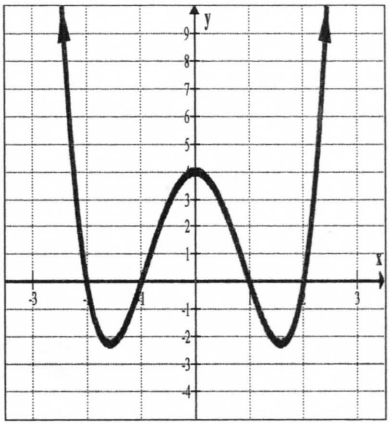
Number of real zeros: 2

Zeros: -2, 2

y-intercept: (0,4)

End Behavior:
as $x \to \infty$, $y \to -\infty$
$x \to -\infty$, $y \to -\infty$

10.



Degree: even

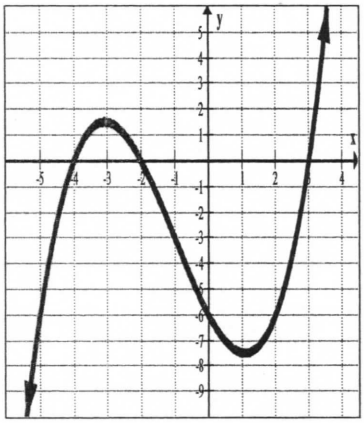
Number of real zeros: 4

Zeros: -2, -1, 1, 2

y-intercept: (0,4)

End Behavior:
as $x \to \infty$, $y \to \infty$
$x \to -\infty$, $y \to \infty$

11.



Degree: odd

Number of real zeros: 3

Zeros: -4, -2, 3

y-intercept: (0,-6)

End Behavior:
as $x \to \infty$, $y \to \infty$
$x \to -\infty$, $y \to -\infty$

Determine the y – intercept for each of the functions listed below.

12. $f(x)=-7x^3-5x^2+4x$

y int: (0,0)

13. $f(x)=8x^4-5x^2+14$

y int: (0,14)