



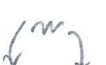
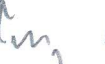
**Zeros and Multiplicity:**

Multiplicity determines if a function crosses the x-axis or bounces off the x-axis.

Odd multiplicity: *graph crosses through x-axis*

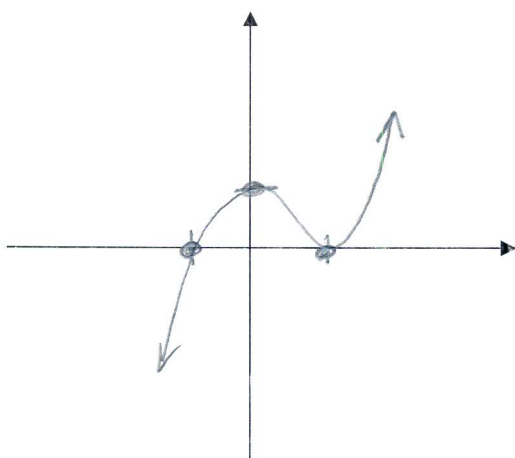
Even multiplicity: *graph bounces off x-axis*

**Degree and End-Behavior:**

	Even degree	Odd Degree
Positive leading coefficient	 as $x \rightarrow \pm \infty$ $f(x) \rightarrow \infty$	 as $x \rightarrow \infty, f(x) \rightarrow \infty$ as $x \rightarrow -\infty, f(x) \rightarrow -\infty$
Negative leading coefficient	 as $x \rightarrow \pm \infty$ $f(x) \rightarrow -\infty$	 as $x \rightarrow \infty, f(x) \rightarrow -\infty$ as $x \rightarrow -\infty, f(x) \rightarrow \infty$

Sketch each function, showing zeros, y-intercept, and end behavior. Identify the characteristics of each function.

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



Zeros                  multiplicity                  cross/bounce?

1                          2                          bounce

-1                          1                          cross

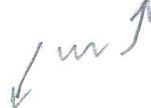
y-intercept? (0, 1)                   $f(0) = (-1)^2(1)$

Degree of Polynomial Function? 3

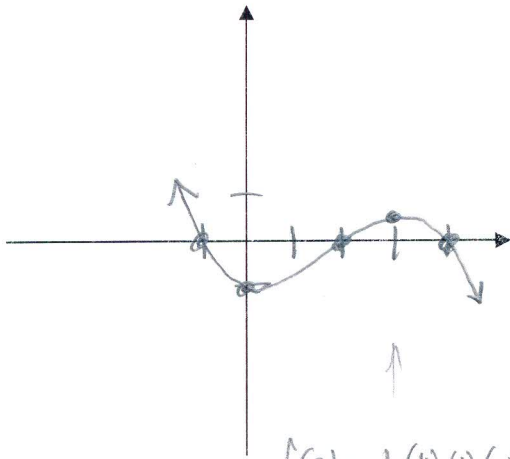
Pos./Neg. Leading Coefficient? +

Describe the end behavior?

*As  $x \rightarrow \infty, f(x) \rightarrow \infty$*   
*As  $x \rightarrow -\infty, f(x) \rightarrow -\infty$*



2.  $f(x) = -\frac{1}{8}(x+1)(x-2)(x-4)$



$f(3) = -\frac{1}{8}(4)(1)(-1)$   
 $f(3) = \frac{1}{2}$

Zeros                      multiplicity                      cross/bounce?

-1                      1                      CROSS

2                      1                      CROSS

4                      1                      CROSS

y-intercept? (0, -1)       $f(0) = -\frac{1}{8}(1)(-2)(-4)$

Degree of Polynomial Function? 3

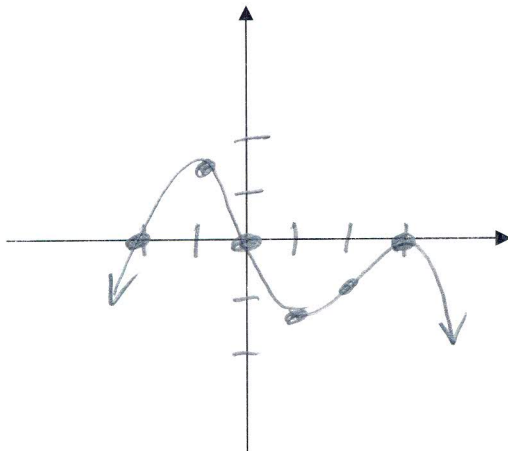
Pos./Neg. Leading Coefficient? -

Describe the end behavior?

as  $x \rightarrow -\infty, f(x) \rightarrow \infty$

as  $x \rightarrow \infty, f(x) \rightarrow -\infty$

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



$f(-1) = \frac{1}{10}(16)(1)$

$f(-1) = 1.6$

$f(1) = -\frac{1}{10}(4)(3) = -1.2$

$f(2) = -\frac{1}{5}(1)(4) = -0.8$

Zeros                      multiplicity                      cross/bounce?

0                      1                      CROSS

3                      2                      BOUNCE

-2                      1                      CROSS

y-intercept? (0, 0)       $f(0) = 0$

Degree of Polynomial Function? 4

Pos./Neg. Leading Coefficient? -

Describe the end behavior?

as  $x \rightarrow \pm\infty,$

$f(x) \rightarrow -\infty$