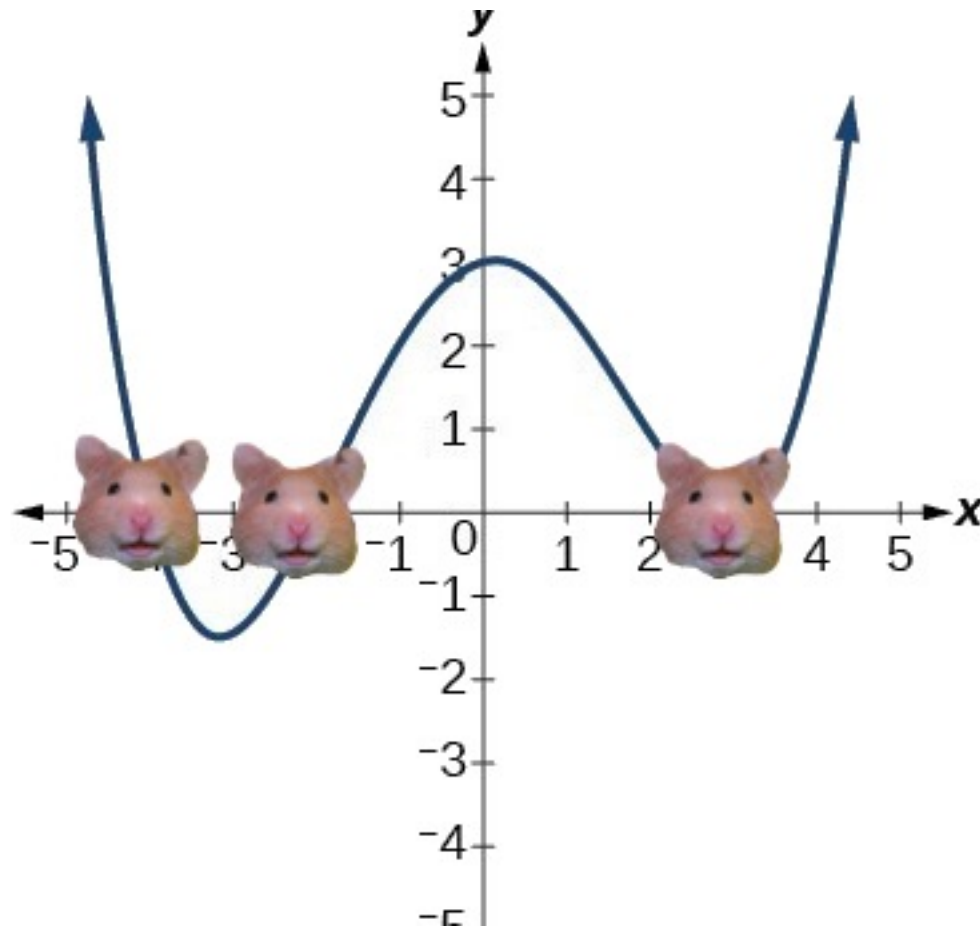


Finding Zeros of Polynomials



By the end of this lesson, I will be able to answer the following questions...

1. What are zeros of polynomials?
2. What are the techniques to find the zeros of a polynomial?
3. How do I find zeros of a polynomial using technology?
4. What is multiplicity?
5. how does multiplicity affect a polynomial graph?

Vocabulary

1. **Zeros of a polynomial** - the “x” value(s) of polynomials that make the function zero. Also, can be considered the x-intercepts of the function.
2. **Multiplicity** - when a function has multiple zeros at a single point, that will affect the graph in certain ways.
3. **Tangency** - when a two graphs intersect and exactly one point.

Prerequisite Skills with Practice

Revisiting Factoring, Zero Product Property, the Quadratic Formula and Using Square Roots

Solve the following and verify your solutions using technology

solve by factoring

$$x^2 + 9x + 20 = 0$$

solve by factoring

$$2x^2 - 17x + 35 = 0$$

solve by factoring

$$x^2 - 10x = 0$$

solve by using square roots

$$2x^2 - 9 = 0$$

solve by using square roots

$$(x - 4)^2 - 5 = 20$$

solve using the quadratic formula

$$2x^2 - 3x - 4 = 0$$

The **fully factored form** of $f(x)$ is:

The **zeros** are:

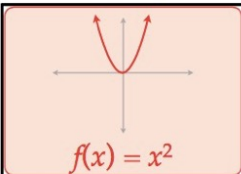
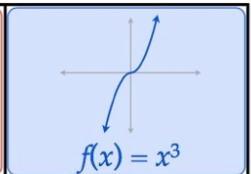
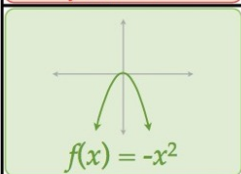
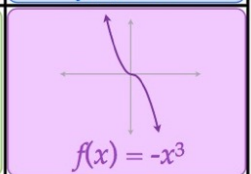
The **x -intercepts** are:

The **y -intercept** of the polynomial is:

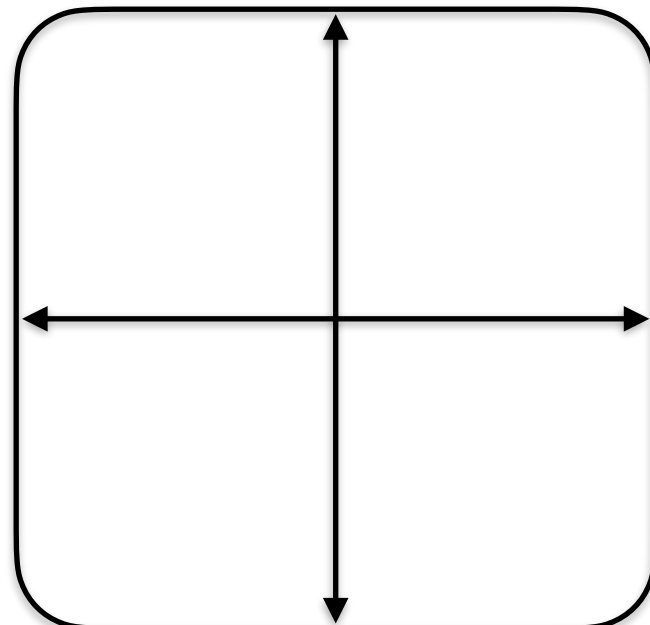
The **end behavior** of the polynomial is...

if $x \rightarrow \infty$ then $y \rightarrow$ _____

if $x \rightarrow -\infty$ then $y \rightarrow$ _____

| | Even Degree | Odd Degree |
|----------|--|--|
| Positive |  $f(x) = x^2$ |  $f(x) = x^3$ |
| Negative |  $f(x) = -x^2$ |  $f(x) = -x^3$ |

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



The **fully factored form** of $f(x)$ is:

The **zeros** are:

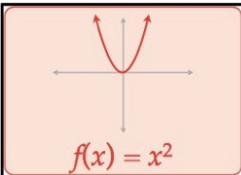
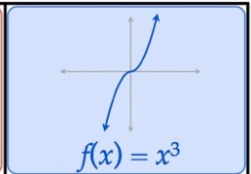
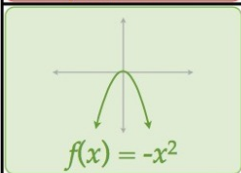
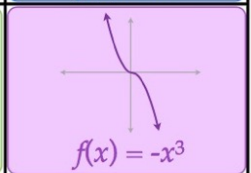
The **x -intercepts** are:

The **y -intercept** of the polynomial is:

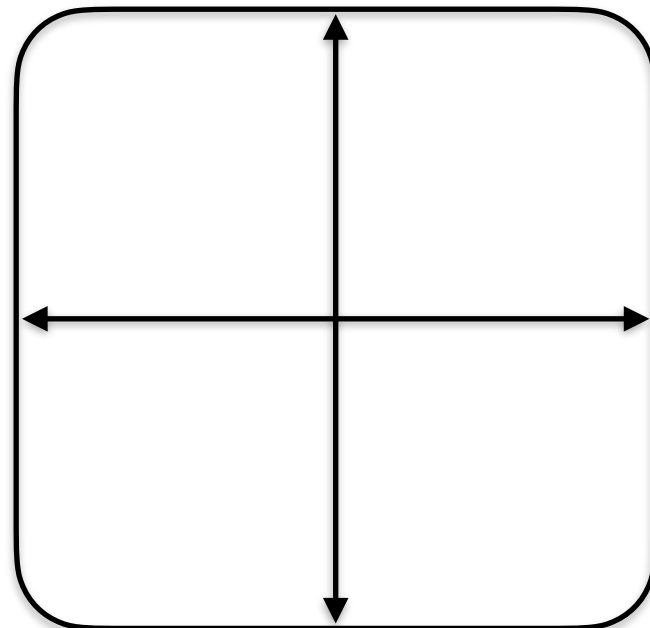
The **end behavior** of the polynomial is...

if $x \rightarrow \infty$ then $y \rightarrow$ _____

if $x \rightarrow -\infty$ then $y \rightarrow$ _____

| | Even Degree | Odd Degree |
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| Positive |  $f(x) = x^2$ |  $f(x) = x^3$ |
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$$f(x) = -x^3 + 9x$$



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

The **fully factored form** of $f(x)$ is:

The **zeros** are:

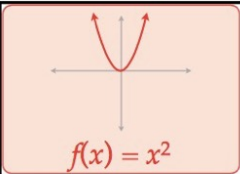
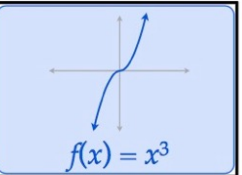
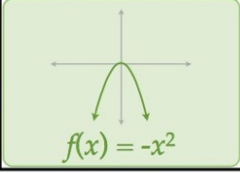
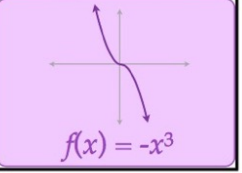
The **x -intercepts** are:

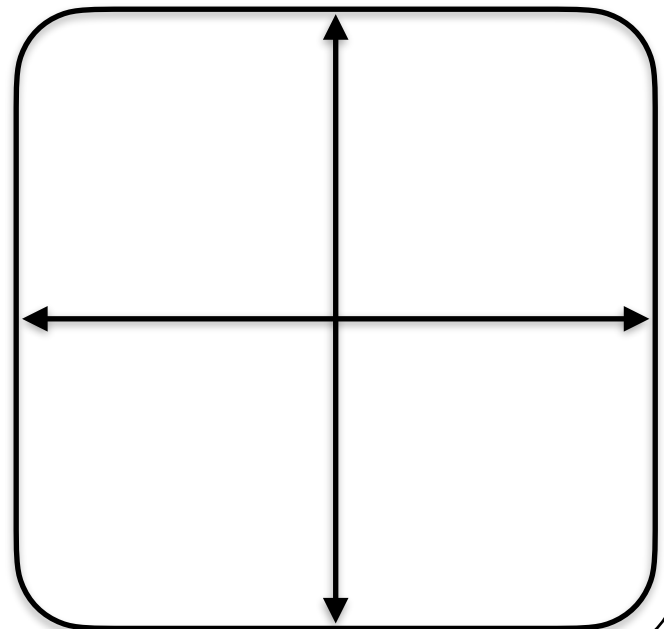
The **y -intercept** of the polynomial is:

The **end behavior** of the polynomial is...

if $x \rightarrow \infty$ then $y \rightarrow$ _____

if $x \rightarrow -\infty$ then $y \rightarrow$ _____

| | Even Degree | Odd Degree |
|----------|--|--|
| Positive |  $f(x) = x^2$ |  $f(x) = x^3$ |
| Negative |  $f(x) = -x^2$ |  $f(x) = -x^3$ |



The **fully factored form** of $f(x)$ is:

The **zeros** are:

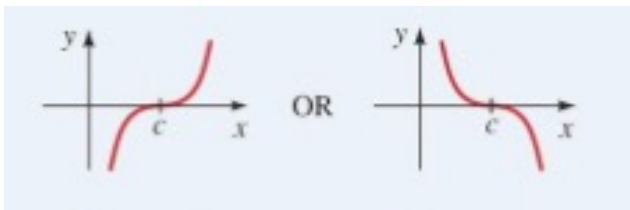
The ***x*-intercepts** are:

The ***y*-intercept** of the polynomial is:

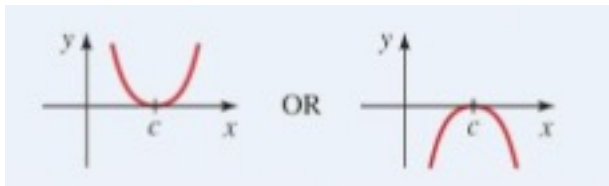
The **end behavior** of the polynomial is...

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if $x \rightarrow -\infty$ then $y \rightarrow$ _____



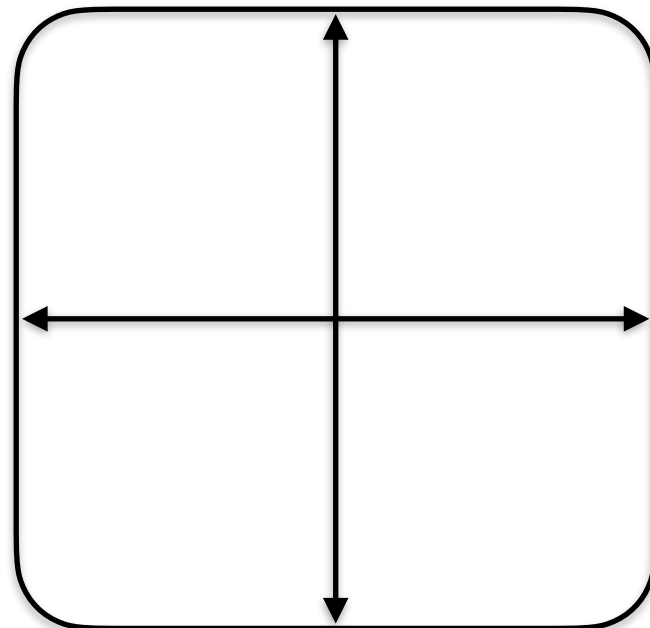
Graph behavior around *x*-intercept
for or odd multiplicities



Graph behavior around *x*-intercept
for or even multiplicities

$$g(x) = 2x^4 - 2x^2$$

| | Even Degree | Odd Degree |
|----------|-------------------|-------------------|
| Positive | $f(x) = x^2$ | $f(x) = x^3$ |
| Negative | $f(x) = -x^2$ | $f(x) = -x^3$ |



The **fully factored form** of $f(x)$ is:

The **zeros** are:

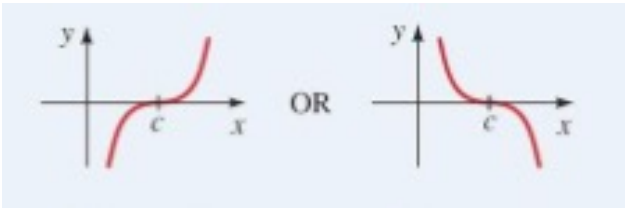
The ***x*-intercepts** are:

The ***y*-intercept** of the polynomial is:

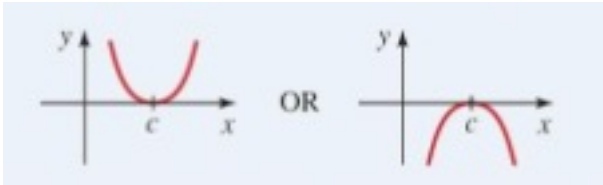
The **end behavior** of the polynomial is...

if $x \rightarrow \infty$ then $y \rightarrow$ _____

if $x \rightarrow -\infty$ then $y \rightarrow$ _____



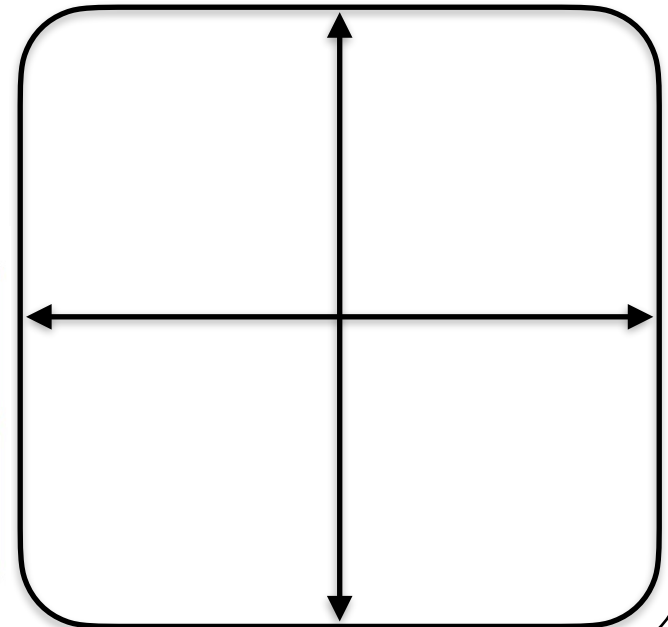
Graph behavior around x-intercept for or odd multiplicities



Graph behavior around x-intercept for or even multiplicities

$$g(x) = 2x^5 - 5x^2$$

| | Even Degree | Odd Degree |
|----------|-------------------|-------------------|
| Positive | $f(x) = x^2$ | $f(x) = x^3$ |
| Negative | $f(x) = -x^2$ | $f(x) = -x^3$ |



The **fully factored form** of $f(x)$ is:

The **zeros** are:

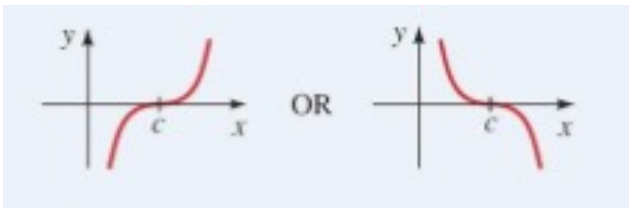
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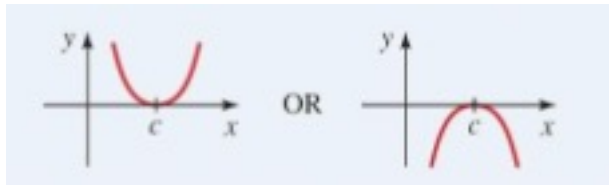
The **end behavior** of the polynomial is...

if $x \rightarrow \infty$ then $y \rightarrow$ _____

if $x \rightarrow -\infty$ then $y \rightarrow$ _____



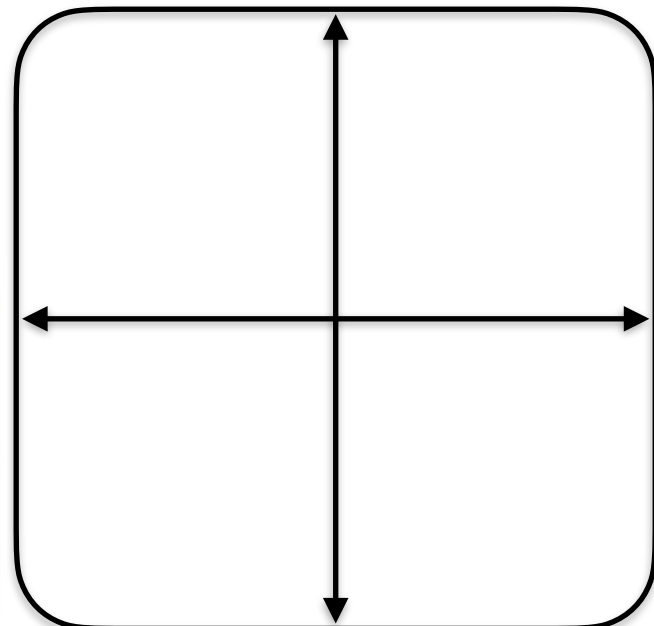
Graph behavior around x -intercept
for or odd multiplicities



Graph behavior around x -intercept
for or even multiplicities

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

| | Even Degree | Odd Degree |
|----------|-------------------|-------------------|
| Positive | $f(x) = x^2$ | $f(x) = x^3$ |
| Negative | $f(x) = -x^2$ | $f(x) = -x^3$ |



THE END



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