Day 03 Polynomial Functions & Behavior
Master &

1-4: For each of the functions and their given graphs below, state the indicated information.

1. $f(x) = 2x^3 + 5x^2 - 18x - 15$

Degree: _3_

Even or odd degree: _ODD_

# of zeros: _3_

# of x-intercepts: _3_

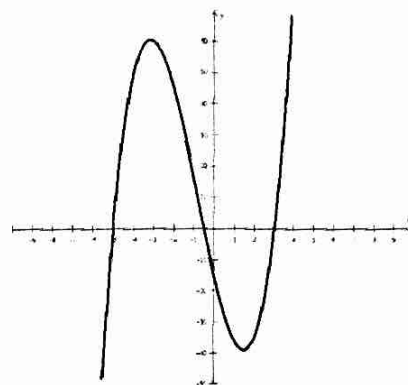# of turns: _2_

Leading coefficient: _2_

Ends same or opposite: _OPP_

Behavior as $x \rightarrow -\infty$: $f(x) \rightarrow -\infty$

Behavior as $x \rightarrow \infty$: $f(x) \rightarrow +\infty$

2. $f(x) = x^4 - 2x^3 - 13x^2 + 14x + 24$

Degree: _4_

Even or odd degree: _EVEN_

# of zeros: _4_

# of x-intercepts: _4_

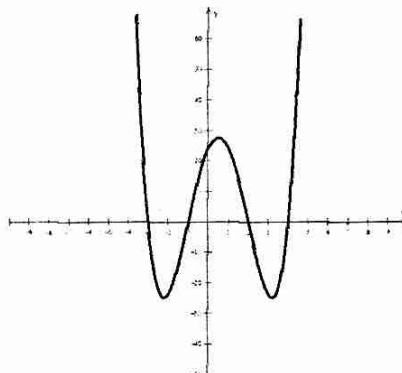# of turns: _3_

Leading coefficient: _1_

Ends same or opposite: _SAME_

Behavior as $x \rightarrow -\infty$: $f(x) \rightarrow +\infty$

Behavior as $x \rightarrow \infty$: $f(x) \rightarrow +\infty$

3. $f(x) = -2x^5 - 5x^4 + 24x^3 + 41x^2 - 34x - 24$

Degree: _5_

Even or odd degree: _ODD_

# of zeros: _5_

# of x-intercepts: _5_
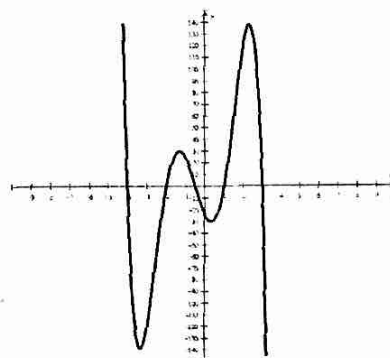
# of turns: _4_

Leading coefficient: _-2_

Ends same or opposite: _OPP_
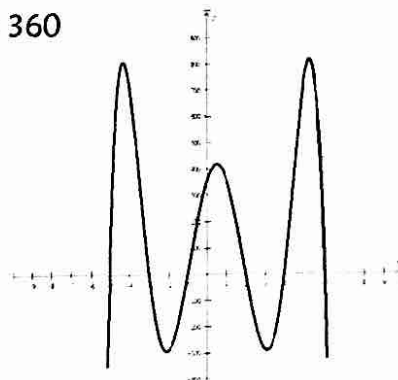
Behavior as $x \rightarrow -\infty$: $f(x) \rightarrow +\infty$

Behavior as $x \rightarrow \infty$: $f(x) \rightarrow -\infty$

4. $f(x) = -0.5x^6 + 1.5x^5 + 20.5x^4 - 43.5x^3 - 176x^2 + 198x + 360$

Degree: __6__

Even or odd degree: __EVEN__

# of zeros: __6__

# of x-intercepts: __6__

# of turns: __5__

Leading coefficient: __-0.5__

Ends same or opposite: __SAME__

Behavior as $x \to -\infty$: __$f(x) \to -\infty$__

Behavior as $x \to \infty$: __$f(x) \to -\infty$__

From what we have seen in the previous examples, we can conclude the following:

5. The number of zeros is __EQUAL__ to the degree of the function

6. The maximum number of x-intercepts is __EQUAL__ to the degree of the function

7. The maximum number of turns is __1 LESS__ than the degree

8. The ends of the function go in the __SAME__ direction for even functions and __OPPOSITE__ directions for odd functions

9. The __SIGN__ of the leading coefficient tells us if the right-end of the function will go __UP__ or __DOWN__

10. A function with __ODD__ degree will always have an ODD number of real zeros.

11. A function with __EVEN__ degree will always have an even number of real zeros, or have no real zeros at all.

12. __IMAGINARY/COMPLEX__ zeros will ALWAYS occur in <u>conjugate pairs</u>. (3 + 4i and 3 – 4i, for example)

13-14: Use what you learned to fill the indicated blanks for the polynomial functions below. 1st term!

13. $f(x) = x^8 + x^7 + 6x^6 - 5x^4 + 3x - 2$

- Degree: __8__
- Even or odd degree: __EVEN__
- # of zeros: __8__
- max # of turns: __7__
- max # of x-int.: __8__
- Leading coefficient: __1__
- Ends same or opposite: __SAME__
- Behavior as $x \to -\infty$: __$f(x) \to +\infty$__
- Behavior as $x \to \infty$: __$f(x) \to +\infty$__
- Possible number of imaginary zeros: __0,2,4,6,8__
- Minimum number of real zeros: __0,2,4,6,8__

14. $f(x) = 3 - 2x^4 + 7x^2 - 3.5x + 2.5x^3 \boxed{- 0.25x^7} + 5x^5$

- Degree: __7__
- Even or odd degree: __ODD__
- # of zeros: __7__
- max # of turns: __6__
- max # of x-int.: __7__
- Leading coefficient: __-0.25__
- Ends same or opposite: __OPP.__
- Behavior as $x \to -\infty$: __$f(x) \to +\infty$__
- Behavior as $x \to \infty$: __$f(x) \to -\infty$__
- Possible number of imaginary zeros: __0,2,4,6__
- Minimum number of real zeros: __1__