2.2 Polynomial Functions of Higher Degree Day 1

I. Graphs of Polynomials:

-are continuous; there are no breaks, holes, or gaps

-are smooth and have rounded turns; not sharp ones

II. Leading Coefficient Test--whether the graph of a polynomial rises or falls can be determined by the functions degree (odd or even) and the sign (positive or negative) of the leading coefficient.

1. When the degree is n is odd, the ends go in opposite directions.
If the leading coefficient is greater than zero, then the graph falls to the left and rises to the right.
If the leading coefficient is less than zero, then the graph rises to the left and falls to the right.

2. When the degree of n is even, the ends of the graph go in the same direction.
If the leading coefficient is greater than zero, the graph rises to the left and to the right.
If the leading coefficient is less than zero, the graph falls to the right and left.

Ex 1) **Use the Leading Coefficient Test to describe the right-hand and left-hand behavior.**

a) $f(x) = -x^3 + 4x$ odd neg.

left → rises
right → falls

b) $f(x) = x^4 - 5x^2 + 4$ even pos

left → rises
right → rises

c) $f(x) = x^5 - x$ odd pos

left → falls
right → rises

III. Finding Zeros of a Polynomial

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

$x(x^2 - x - 2) = 0$

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

$\boxed{x=0}$ $x-2=0$ $x+1=0$

$\boxed{x=2}$ $\boxed{x=-1}$

$x^2+2x+4=0$

Ex 3) $f(x) = 49 - x^2$

$(7+x)(7-x)=0$

$$49 - x^2 = 0$$
$$-49 \qquad -49$$
$$-x^2 = -49$$
$$\frac{-x^2}{-1} = \frac{-49}{-1}$$
$$\sqrt{x^2} = \sqrt{49}$$

$x = \pm 7$

Ex 4) $h(x) = 2x^2 - 14x + 24$

$$\frac{2x^2}{2} - \frac{14x}{2} + \frac{24}{2}$$
$$2(x^2 - 7x + 12) = 0$$
$$2(x-4)(x-3) = 0$$
$$x - 4 = 0 \qquad x - 3 = 0$$
$$\boxed{x = 4} \qquad \boxed{x = 3}$$