Trig 4.1

Determine roots of polynomial equations *
Apply the fundamental theorem of algebra (# of roots) *

*Algebra 2 Ch. 5 & Ch. 7

degree

leading coefficient

polynomial function
    zeros (real)

polynomial equation
    Roots (can be real or imag.)

= 0

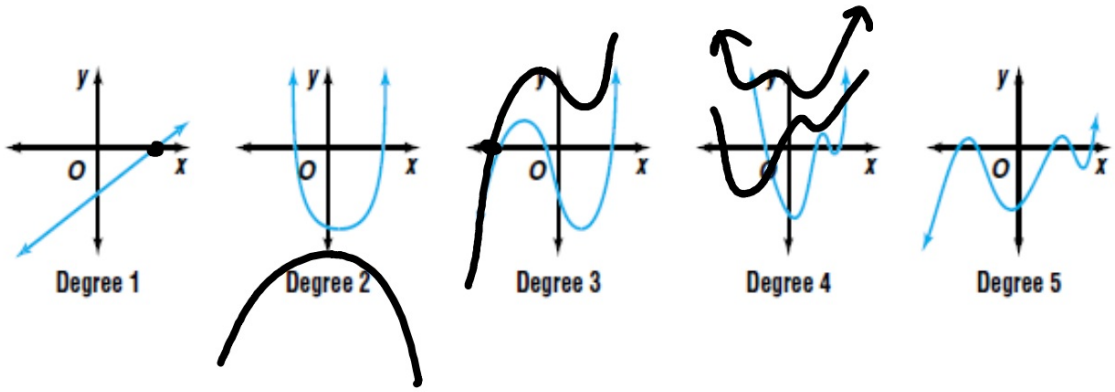
imaginary number

real number

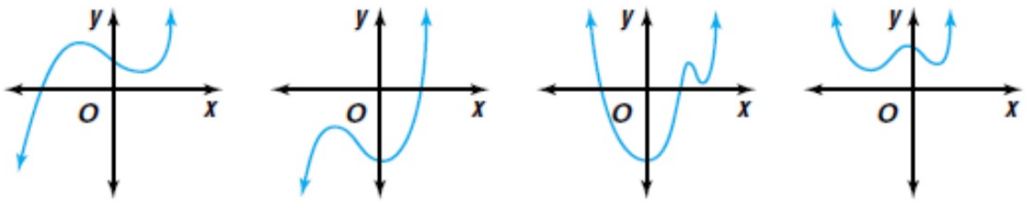
complex number

Fundamental Theorem of Algebra

(at most)
d = real sols



FTA: equation of degree n has at most n real solutions



State the degree and leading coefficient of each polynomial.

5. $a^3 + 6a + 14$

6. $5m^2 + 8m^5 - 2$

Determine whether each number is a root of $x^3 - 5x^2 - 3x - 18 = 0$. Explain.

7. 5

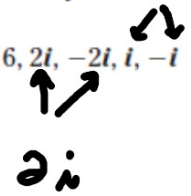
8. 6

Alg 2 4.3

Write a polynomial equation of least degree for each set of roots. Does the equation have an odd or even degree? How many times does the graph of the related function cross the *x*-axis?

9. $-5, 7$

10. $6, 2i, -2i, i, -i$



conjugate pair

$x^3 \qquad = 0$

$x=3 \quad x=2-i \quad x=2+i$

$x-2+i$

$x-2-i$

$= 0$

$(x-3)(x^2-4x+5) = 0$

$(x-3)(x-2+i)(x-2-i) = 0$

$x=3 \quad x=2-i \quad x=2+i$

x^2-4x+5

GC = non real roots

State the number of complex roots of each equation. Then find the roots and graph the related functions. 1 + 2 − 8

11. $x^2 - 14x + 49 = 0$ 12. $a^3 + 2a^2 - 8a = 0$ 13. $t^4 - 1 = 0$

$(x-7)(x-7) = 0$ $-8+8+16 = 0$

$x = 7$

$x = 7$

$x-7=0$ $x-7=0$

49

-7 -7

-14

$a(a^2+2a-8) = 0$

-8

4 -2

2

$a(a+4)(a-2) = 0$

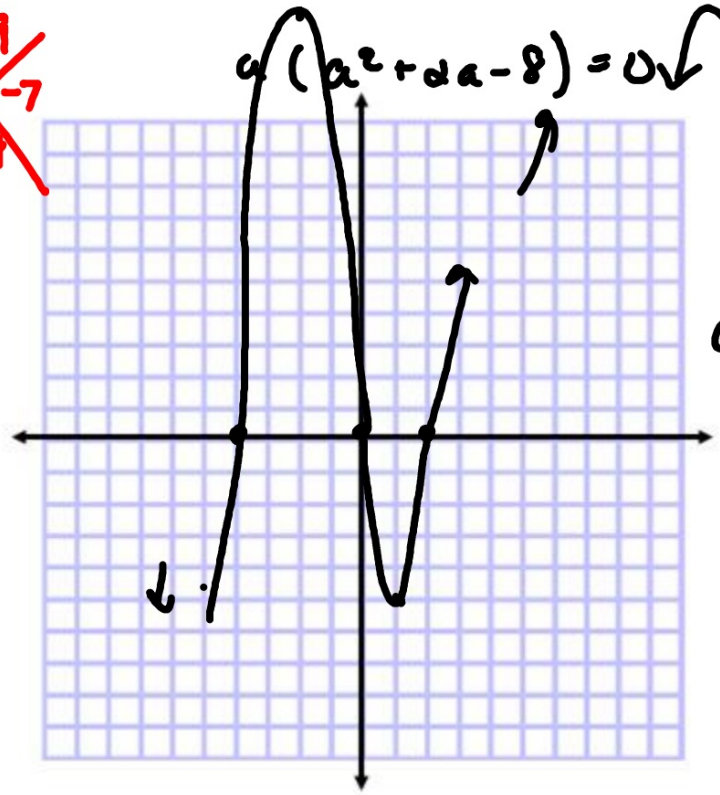
$a = 0$ $a+4=0$ $a-2=0$

$a=-4$ $a=2$

$f(1) = -5$

$f(-2)$

Use everything that you know:
# of roots
factoring
crossing points
end behavior

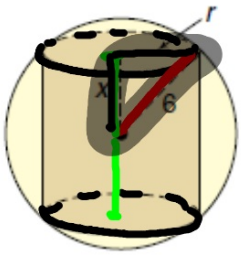


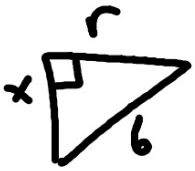
14. Geometry A cylinder is inscribed in a sphere with a radius of 6 units as shown.

a. Write a function that models the volume of the cylinder in terms of x. (*Hint:* The volume of a cylinder equals $\pi r^2 h$.)

b. Write this function as a polynomial function.

c. Find the volume of the cylinder if $x = 4$.





$x^2 + r^2 = 36$

$-x^2 \quad -x^2$

$r^2 = 36 - x^2$

It's messy, don't be scared.
Exact answer (in terms of π)

$V =$ x

b) $V = \pi r^2 h$

$V = \pi (36 - x^2)(2x)$

$f(x) = \pi (72x - 2x^3)$

c) $f(4) = \pi (288 - 128)$

$= \pi (160) = 160\pi$

WB 4.2