Find all Complex zeros by Factoring.

$$y = 2x^4 - 6x^3 + 8x^2 - 24x$$

$$2x\left(x^3 - 3x^2 + 4x - 12\right)$$

	x	-3
x^2	x^3	$-3x^2$
$+4$	$+4x$	-12

$$y = 2x(x-3)(x^2+4)$$

$$x^2+4=0$$
$$\sqrt{x^2} = \sqrt{-4}$$
$$x = \pm 2i$$

Zeros are:

$$x = 0,\ 3,\ \pm 2i$$

Find all Complex zeros by Factoring.

$$y = 2x^5 - 72x$$

$$y = 2x(x^4 - 36)$$

$$y = 2x(x^2-6)(x^2+6)$$

$x^2-6=0$ | $x^2+6=0$

$\sqrt{x^2}=\sqrt{6}$ | $\sqrt{x^2}=\sqrt{-6}$

$x=\pm\sqrt{6}$ | $x = \pm i\sqrt{6}$

Zeros are:

$$x = 0,\ \pm\sqrt{6},\ \pm i\sqrt{6}$$

How do you find solutions
if you can't factor a polynomial?

Solve by graphing

But, this will only give you real solutions
and they may not be EXACT.

You can find zeros/solutions by graphing:

1. Graphing the two sides separately and find points of intersection.

   Sometimes when using this method it's difficult to see how many times they intersect unless you change the Window. Or, just use the next method.

2. Moving all terms to one side and finding the x-intercepts(zeros) by:
   a. 2nd TRACE Option 2: zero

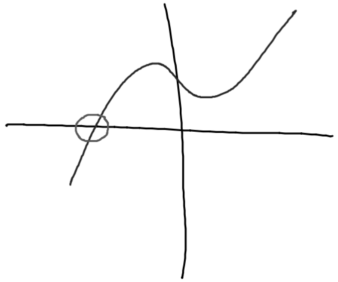
   This method is nice because all you need to focus on is the x-axis which means Y_{min} and Y_{max} aren't very important.

   b. Graphing the eq in Y_1 and Y_2=0 and finding points of intersection.

Find all real zeros/solutions by graphing.
Round to the nearest hundredth.

$$y = 0.1x^3 + 0.2x^2 - 1.1x + 2.8$$

Graph looks like this:



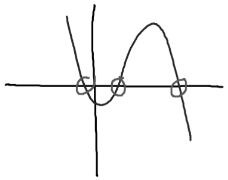
The only real zero is:

$\boxed{x = -5.17}$

Find all real zeros/solutions by graphing.
Round to the nearest hundredth.

$$3x^2 - 3x + 2 = x^3 - 2x^2 + 3$$

moving all terms to the left side and graphing gives you the following



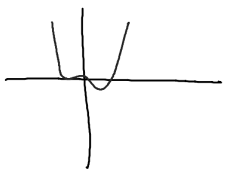
The 3 zeros are:

$\boxed{x = -0.24, 1, 4.24}$

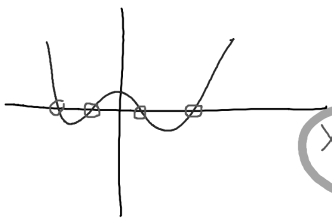
Find all real zeros/solutions by graphing.
Round to nearest hundredth.

$$x^4 - 3x = 2x^2 - 2.4x - 0.28$$

If you move all the terms to the left side and graph you'll see:



Change the window to get a better picture shows this graph:



The 4 zeros are:

$x = -1.11, -0.65, 0.26, 1.51$

You can now finish Hwk #27: Sec 6-4

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Problems: 23, 24, 29, 30, 33, 36

29, 30: EXACT complex sol's by factoring

33, 36: Real solutions by graphing.

For a function to be a polynomial

- Exponents must be whole numbers.
- Coefficients must be real numbers.

Variables can't be:

- under a radical
- in the denominator
- an exponent

1. State if each is a polynomial or not. If not, circle the reason why not, or explain why it isn't.

a) $y = 4x^3 - 9x^{-2} + \frac{3}{x} - 1$ No

b) $y = -9.23x^4 + \frac{7}{8}x^9 - 1000$ Yes

all exponents are Whole Numbers and all coefficients are real #'s.

c) $y = 8x^2 - 5ix + 2^x$ No

d) $y = 12x^6 + 5\sqrt{2x} - x^{\frac{2}{3}}$ No

Find the actual degree and leading coefficient (numbers not odd/even or pos/neg)

$$y = -8x^2(3x-5)^2(6-x)(2x+7)^3(4x-3)$$

$$(-8x^2)(3x)^2(-x)(2x)^3(4x)$$

$$= (-8x^2)(9x^2)(-x)(8x^3)(4x) = 2304x^9$$

$$\boxed{\begin{array}{l} \text{DEG} = 9 \\ \text{LC} : 2304 \end{array}}$$

Know your vocabulary!!

Names used because of a polynomials degree.

Largest exponent is 0	Name: Constant
Largest exponent is 1	Name: Linear
Largest exponent is 2	Name: Quadratic
Largest exponent is 3	Name: Cubic

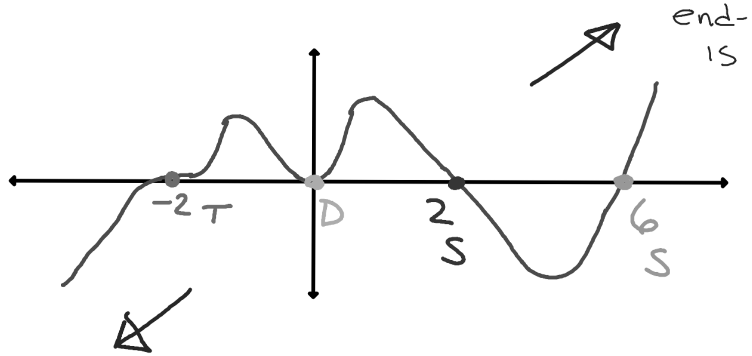
Names used because of a polynomials # of terms.

1 Term	Name: Monomial
2 Terms	Name: Binomial
3 Terms	Name: Trinomial

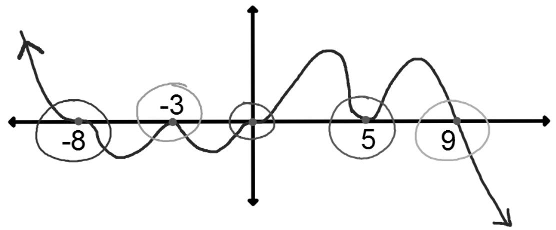
2. Sketch the graph of this polynomial. Include the correct end-behavior and shape at each zero. Label the x-axis with each zero.

$$y = -5x^2(2-x)(x+2)^3(x-6)$$

DEG: ODD
L.C.: POS
end-behavior is (↙, ↗)



Write the EXACT equation of this polynomial, using the proper value of a, given the graph passes through the point (-2, -1862784).



NEG ODD
end-behavior

$y = ax^3(x+8)^3(x+3)^2(x-5)^2(x-9)$

using $(-2, -1862784)$ replace all x's with -2 and y with -1862784 then solve for a

$-1862784 = a(-2)^3(-2+8)^3(-2+3)^2(-2-5)^2(-2-9)$

$\frac{-1862784}{931392} = \frac{a(931392)}{931392}$ } $a = -2$

$$\boxed{y = -2x^3(x+8)^3(x+3)^2(x-5)^2(x-9)}$$