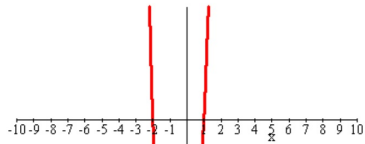Graph to find all real solutions then use these to find
the remaining solutions.

$x = -2, 1, \pm 3i$

$x^4 + x^3 + 7x^2 + 9x - 18 = 0$

Zeros from the graph
are $-2, 1$

use one of the zeros
and division to get

$$\begin{array}{r|rrrrr} -2 & 1 & 1 & 7 & 9 & -18 \\ & & -2 & 2 & -18 & +18 \\ \hline & 1 & -1 & 9 & -9 & 0 \end{array}$$

You can now
try factoring
or use the
other zero
and divide

$x^3 - x^2 + 9x - 9$

$$\begin{array}{r|rrrr} 1 & 1 & -1 & 9 & -9 \\ & & 1 & 0 & 9 \\ \hline & 1 & 0 & 9 & 0 \end{array}$$

$x^2 + 9 \Rightarrow x$

$x = \pm 3i$

State the degree and Leading Coefficient of each polynomial
then describe the end behavior of each polynomial

1. $y = 3x^4 + x^2 - 7x^5 + 84x - 1$

   NEG
   ODD

   Deg = 5   End behavior ($\nearrow$ $\searrow$)
   $LC = -7$

2. $y = (x+5)^2(3x - 1)^3(2 - x)^3(2x + 3)(x - 4)^3$

   $1 \cdot 27 \cdot -1 \cdot 2 \cdot 1$

   Deg 12   End behavior ($\swarrow$ $\searrow$)
   $Lc\ -54$

   NEG
   EVEN

Direct Variation:
When two quantities have a constant ratio.

Variation Constant: $k = \dfrac{y}{x}$

Direct Variation Equations:

$k = \dfrac{y}{x}$ or $y = kx$

Does each table show a direct variation relationship?
If yes find the variation constant and write a direct
variation equation.

A

x	y	$\frac{y}{x}$
-8	-18	2.25
-2	-4.5	2.25
4	9	2.25
12	27	2.25

B

x	y	$\frac{y}{x}$
1	8	= 8
3	9	= 3
5	10	
7	11	NO

Yes
$K = 2.25$
$Y = 2.25x$

The table below shows a direct variation relationship.

x	y
−4	−6
−2	−3
0	0
4	6

1. Find the variation constant. $k = 1.5$

2. Write a direct variation equation.

$1.5 = \dfrac{y}{x}$ or $y = 1.5x$

3. Find y when x = 15

$1.5 = \dfrac{y}{15}$ or $y = 1.5(15) = 22.5$

4. Find x when y = 28

$1.5 = \dfrac{28}{x}$ or $28 = 1.5x$

$18.67 = x$

Real examples of Direct Variation:

- The relationship between the # min walking and the distance traveled.
  $k = speed$
- The relationship between the #hrs worked and your paycheck.
  $k = \dfrac{\$}{hr}$

The number of words typed varies directly with the number of minutes typing.

Ali typed 312 words in 6 minutes.   y varies directly with x

$k = \dfrac{312w}{6min} = 52\ w/min$

Write a direct variation equation for this situation.

$y = 52x$

At the same rate how long will it take him to type 1000 words?

$\dfrac{1000}{52} = \dfrac{52x}{52}$

$19.20 = x$