Turn in the

Pink HW Packet

with all 6 assignments

there is a Stapler on the side desk

Pick Up the Green, Pink, and Purple Solutions to check HW

Have your 2 Polynomial graphs from yesterday out and ready.

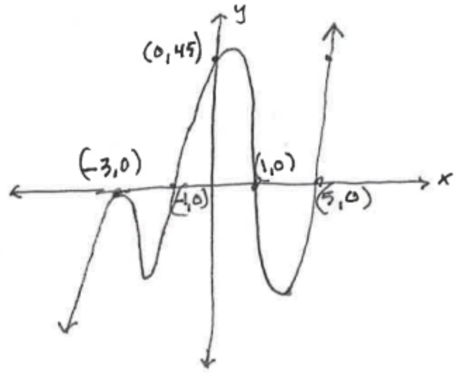
Everyone pick up two pieces of tape for the Polynomial Notes

Turn in the

Pink HW Packet

with all 6 assignments

$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$



Leading term : x^5 Lead coeff. 1

degree: 5

turns 4

Left End Behavior

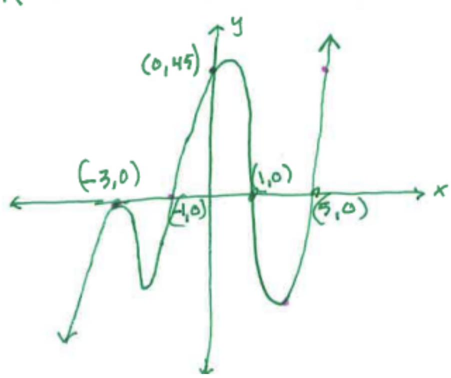
As $x \to -\infty$, $y \to -\infty$

Right End Behavior

As $x \to +\infty$, $y \to +\infty$

$\downarrow \uparrow$

$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$



Leading term : x^5

degree: 5

turns 4

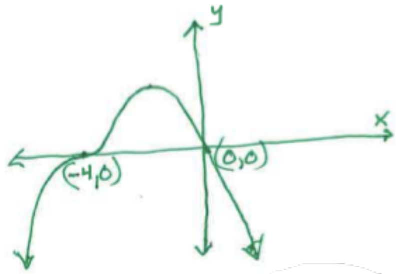
Left End Behavior

As $x \to -\infty$, $y \to -\infty$

Right End Behavior

As $x \to +\infty$, $y \to +\infty$

$P_5(x) = -0.1x(x+4)^3$



Leading term : $-x^4$

degree : 4

turns : 1 and 1 inflection point

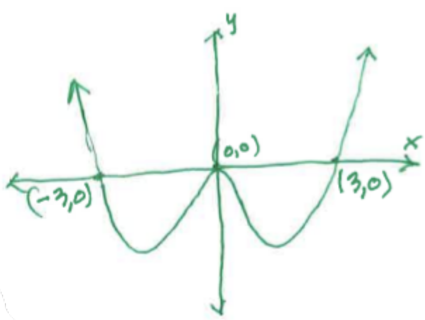
Left End Behavior

As $x \to -\infty$, $y \to -\infty$

Right End Behavior

As $x \to +\infty$, $y \to -\infty$

$P_6(x) = x^4 - 9x^2$



Leading term : x^4

degree : 4

turns : 3

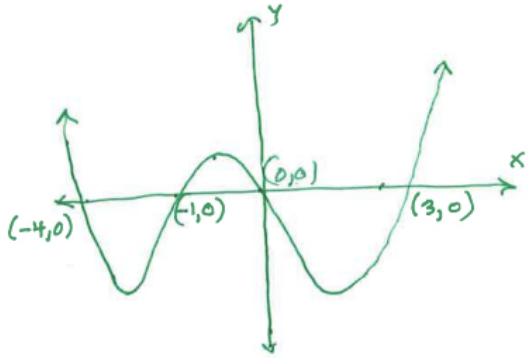
Left End Behavior

As $x \to -\infty$, $y \to +\infty$

Right End Behavior

As $x \to +\infty$, $y \to +\infty$

$P_7(x) = 0.2x(x+1)(x-3)(x+4)$

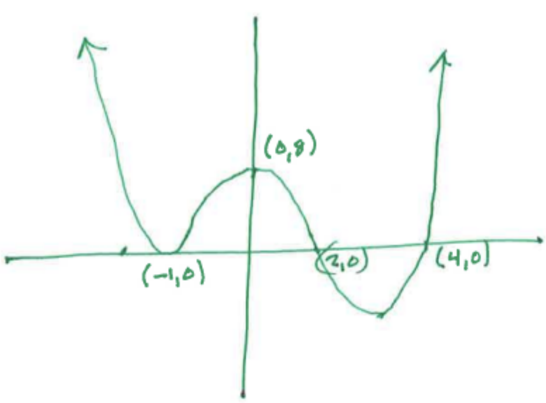


Leading Term : $0.2x^4$
degree: 4
#turns : 3

Left End Behavior
As $x \to -\infty$, $y \to +\infty$

Right End Behavior
As $x \to +\infty$, $y \to +\infty$

$P_8(x) = x^4 - 4x^3 - 3x^2 - 10x + 8$



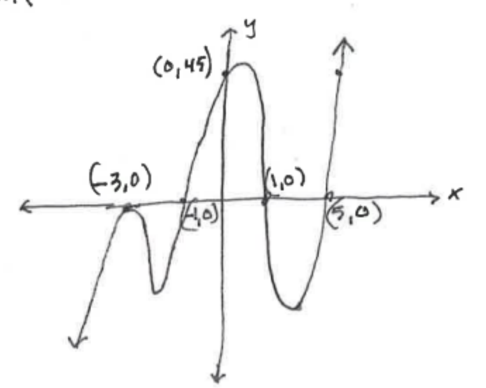
Leading term : x^4
degree : 4
#turns : 3

Left End Behavior
As $x \to -\infty$, $y \to +\infty$

Right End Behavior
As $x \to -\infty$, $y \to \infty$

Keep your graphs out.
We'll use them a bit later.

$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$



Leading term: x^5 Lead coeff. 1

degree: 5

#turns 4

Left End Behavior

As $x \to -\infty$, $y \to -\infty$

Right End Behavior

As $x \to +\infty$, $y \to +\infty$

↓ ↑

Aim

over the next two days

Sketch and Analyze Polynomials

eventually without the help from a graphing calculator

Polynomial Characteristics

Pick Up the Small notesheet from class.

(you can tape it into your own notes later).

A. Degree

The single largest exponent of a polynomial determines the degree, n.

For example: In $y = 2x^8 + 100x^2 - 1677x + 5$, the degree is ___

a^5a^2

a^5b^2

as long as it's in standard form

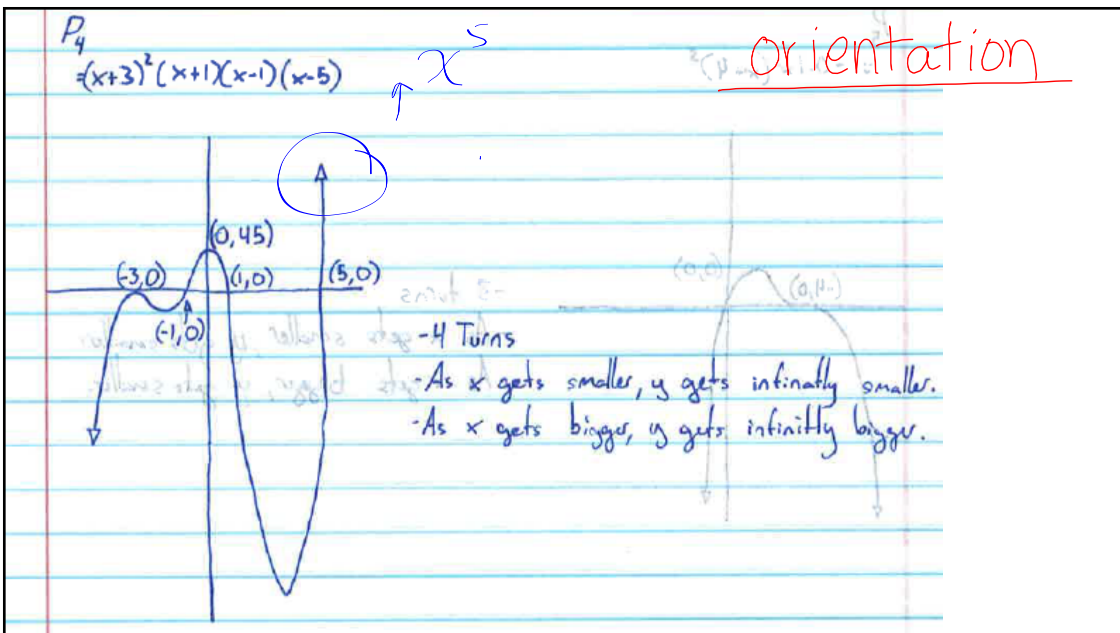
$5x^8$

B. Leading Term

If the leading coefficient of a polynomial is positive, then the polynomial graph will have a positive orientation. Otherwise, the graph will have a negative orientation.

A look back at the Graphing assignment you did yesterday.

Look at the right arrow on one of them.



C. Orientation

If the polynomial has a positive orientation, then right end points ↑

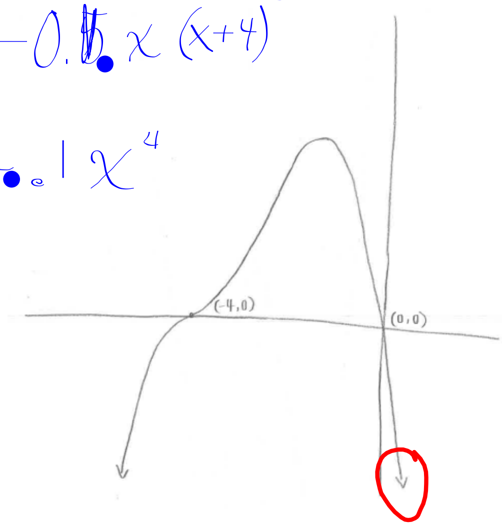
If the polynomial has a negative orientation, then right end points ↓

$P_5(x) = -0.1\, x\,(x+4)^3$

$-0.\cancel{5}1\, x\,(x+4)^3$

$.1x^4$

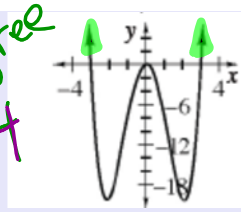
Orientation



Look for a pattern

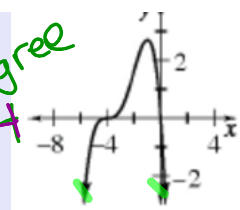
$P_6(x) = x^4 - 9x^2$

degree 4



$P_5(x) = -0.1x(x+4)^3$

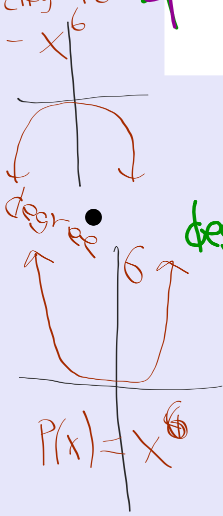
degree 4



degree 6

$-x^6$

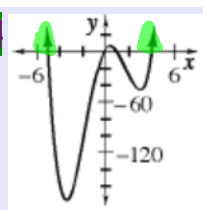
degree 6



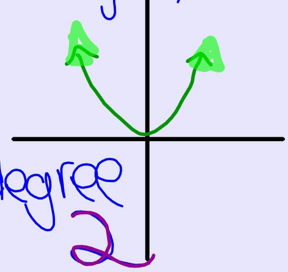
$P(x) = x^6$

$P_3(x) = x^4 - 21x^2 + 20x$

degree 4



$y = x^2$

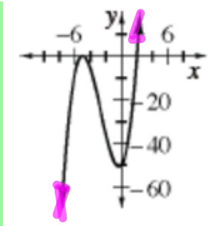


degree 2

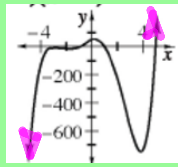
D. End Behavior

degree 3

$P_1(x) = (x-2)(x+5)^2$

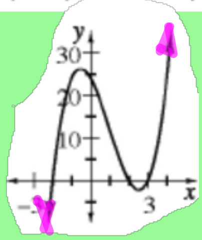


$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$



degree 5

$P_2(x) = 2(x-2)(x+2)(x-3)$



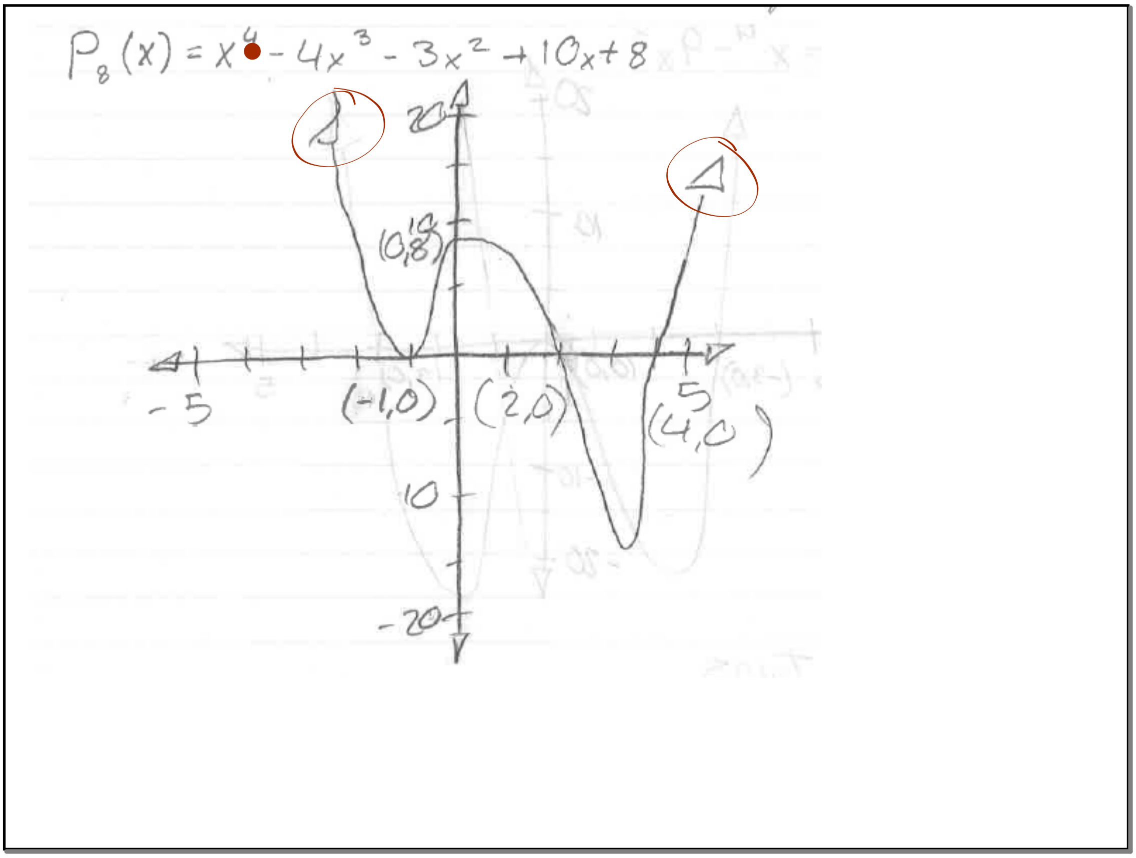
degree 3

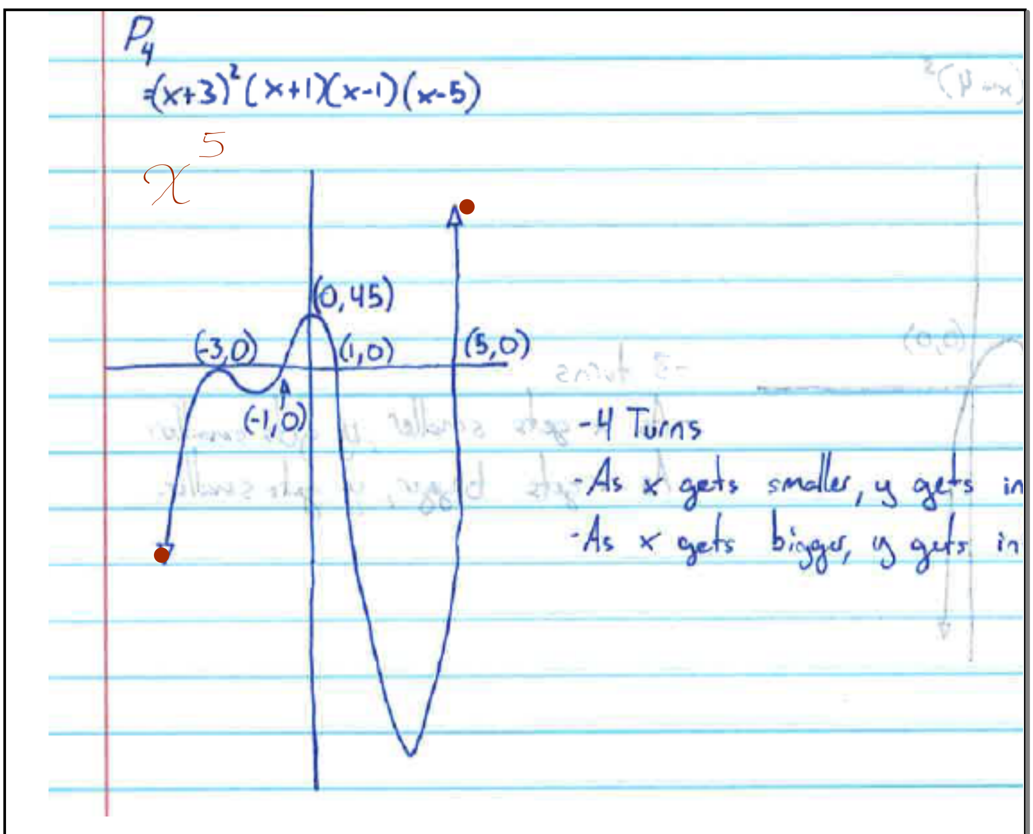
D. End Behavior

An odd degree polynomial has ___opposite___ end behavior (opposite ending y-values)

An even degree polynomial has ___identical___ end behavior (same ending y-values)

$x^4 + 2x$


$P_8(x) = x^4 - 4x^3 - 3x^2 + 10x + 8$
20
(0,8)
10
-5
(-1,0)
(2,0)
5
(4,0)
-10
-20


P_4
$=(x+3)^2(x+1)(x-1)(x-5)$
x^5
(0,45)
(-3,0)
(1,0)
(5,0)
(-1,0)
-4 Turns
-As x gets smaller, y gets in
-As x gets bigger, y gets in

example 1

$Q(x) = \boxed{-3x^5} + 2x^3 - 2x - 7$

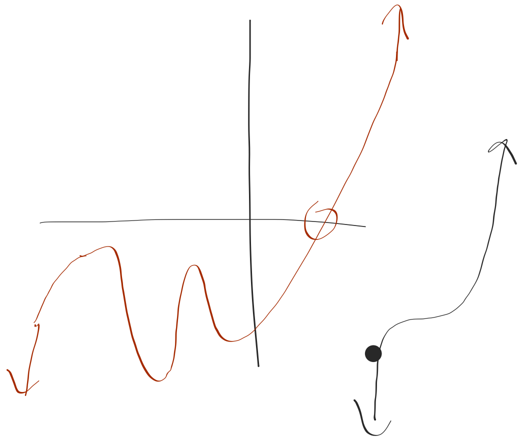
leading term $-3x^5$

degree 5

orientation (−)

informal end behavior $\boxed{\uparrow \downarrow}$ $\downarrow \uparrow$

x-intercepts ?



example 2

$y = -6x(x-2)^3(x-4)$

$(x-0)$

$x \cdot x^3 \cdot x$

Lead. term $\boxed{-6x^5} + \cdots$

degree 5

orient. (−)

end behavior $\uparrow \downarrow$

x-intercepts yes

$x = 2$

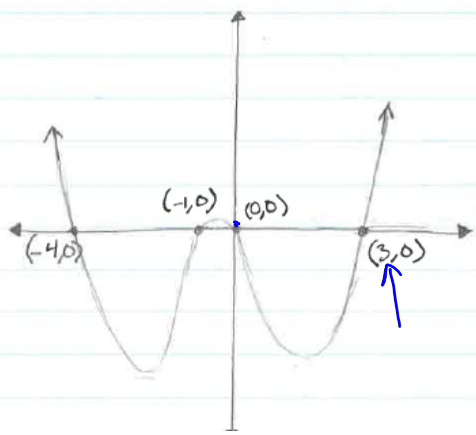
$x = 4$

$x = 0$

every factor produces
one x-intercept

Now go back to one of
your graphs and pick out
one of your x-intercepts.

$P_7(x) = 0.2x(x+1)(x-3)(x+4)$



3 is an x-intercept of the graph

3 is a ZERO of the function $P_7(x)$

3 is a ROOT (solution) of the equation

$0.2x(x+1)(x-3)(x+4) = 0$

$x+4=0$
$x=4$

E. Vocabulary

- If **5** is an intercept of the **graph** of $f(x)$, then **5** is a zero of the **function**, $f(x)$ and **5** is a roots of the **equation** $f(x) = 0$

Reminder:

Be sure you can use your graphing calculator to find an x-intercept....

Many polynomials in standard form make it hard to identify clear x-intercepts and your calculator can at least find an appoximate one for you. In this case, you would be expected to use the "zero" function to find them.

Sketch Artists 1.0

only use the calculator between your ears.

$P(x) = 7(x+10)(x+7)(x-12)$

$(x^2 + \ldots)(x-12)$

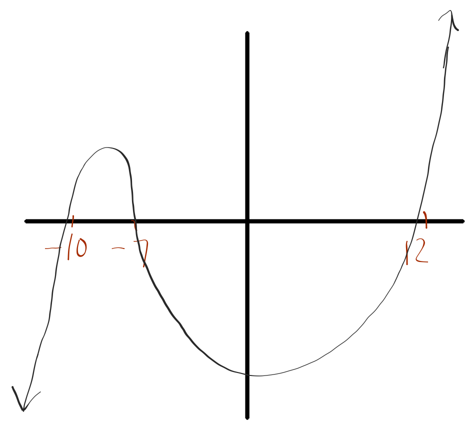
x-intercepts $-10 \quad -7 \quad 12$

leading term $7x^3$

degree 3

orientation $(+)$

end behavior $\downarrow \uparrow$



$Q(x) = -2x(x+6)(x-8)$

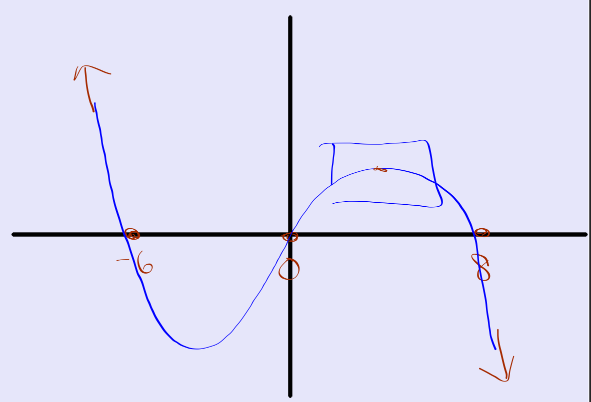
x-intercepts $8 \quad -6 \quad 0$

leading term $-2x^3$

degree 3

orientation $(-)$

end behavior $\uparrow \downarrow$



i.e. What is the maximum number of roots a polynomial of degree 3 can have?

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

2 Questions for your group

1. What is the maximum number of roots a polynomial of degree **n** can have? — a maximum of n

2. Can a polynomial of degree **n** have **fewer** than **n** roots ?

yes

$5x^n + \ldots$

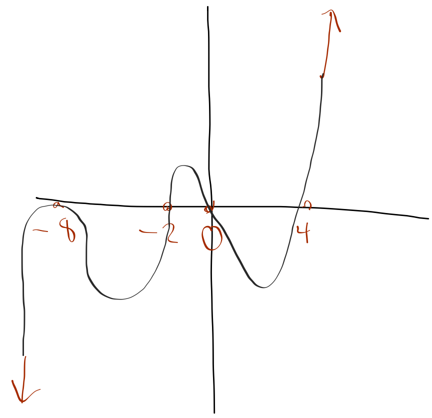
a dilemma

$y = x(x+8)^2(x+2)(x-4)$

Leading: x^5

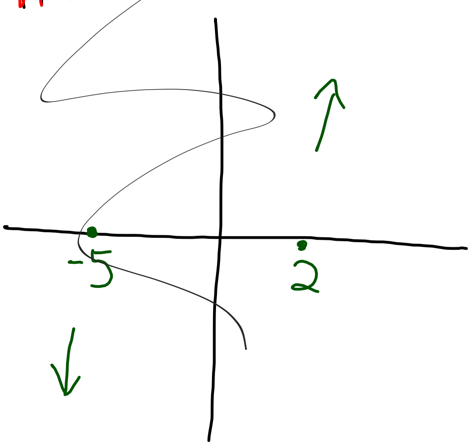
Degree/Orient. 5^{th} degree

End Behav.: ↓ ↑



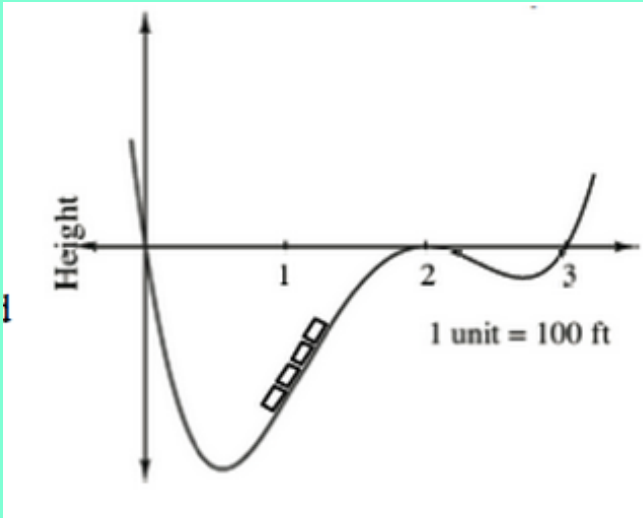
Notes

$P_1(x) = (x-2)(x+5)^2$



Squared factors indicate double roots (creating x-intercepts that bounce)

Single roots (create x-intercepts that cross)



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

See your Ch. 7 test

15

$$\frac{3}{x} + \frac{2}{x+1} = 6$$

$$\frac{3}{x}\cdot\frac{x}{1}\frac{(x+1)}{1} + \frac{2}{x+1}\cdot\frac{x}{1}\frac{(x+1)}{1} = 6\cdot\frac{x}{1}\frac{(x+1)}{1}$$

$$3(x+1) + 2x = 6x(x+1)$$

OR .....

$$\frac{3}{x} + \frac{2}{x+1} = 6$$

$$\frac{3(x+1)}{x(x+1)} + \frac{2(x)}{(x+1)(x)} = 6$$

then what ?

$\overline{83}$

Curved a bit

$\overline{95}$

Assignment

8..... 17-22, 24