Sept. 11, 2017

Warmup

$$\frac{3x^2+x-2}{x^2+6x+5} + \frac{4x^3-22x^2+24x}{6x^3+21x^2-45x}$$

A B C D

m: -6 $-2, 3$

a: 1

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

$3x(x+1)-2(x+1)$

$(3x-2)(x+1)$

x^2+6x+5 m: 5 a: 6 1, 5

$=\boxed{(x+1)(x+5)}$

$4x^3-22x^2+24x$

$=2x(2x^2-11x+12)$ m: 24 a: -11 -8, -3

$=2x(2x^2-8x-3x+12)$

$=2x[2x(x-4)-3(x-4)]$

$=\boxed{2x(2x-3)(x-4)}$

$(4x^2-6x)(x-4)$

$=2x(2x-3)(x-4)$

$$6x^3 + 21x^2 - 45x$$

$$= 3x(2x^2 + 7x - 15)$$

m : -30 $10, -3$

a : 7

$$= 3x(2x^2 + 10x - 3x - 15)$$

$$= 3x[2x(x+5) - 3(x+5)]$$

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

$$= \frac{(3x-2)\cancel{(x+1)}}{\cancel{(x+1)}(x+5)} + \frac{2\cancel{x}\cancel{(2x-3)}(x-4)}{3\cancel{x}\cancel{(2x-3)}(x+5)}$$

restrictions: $x \neq -1, -5, 0, 3/2$

$2x-3 \neq 0,$

$2x \neq 3,$

$x \neq 3/2$

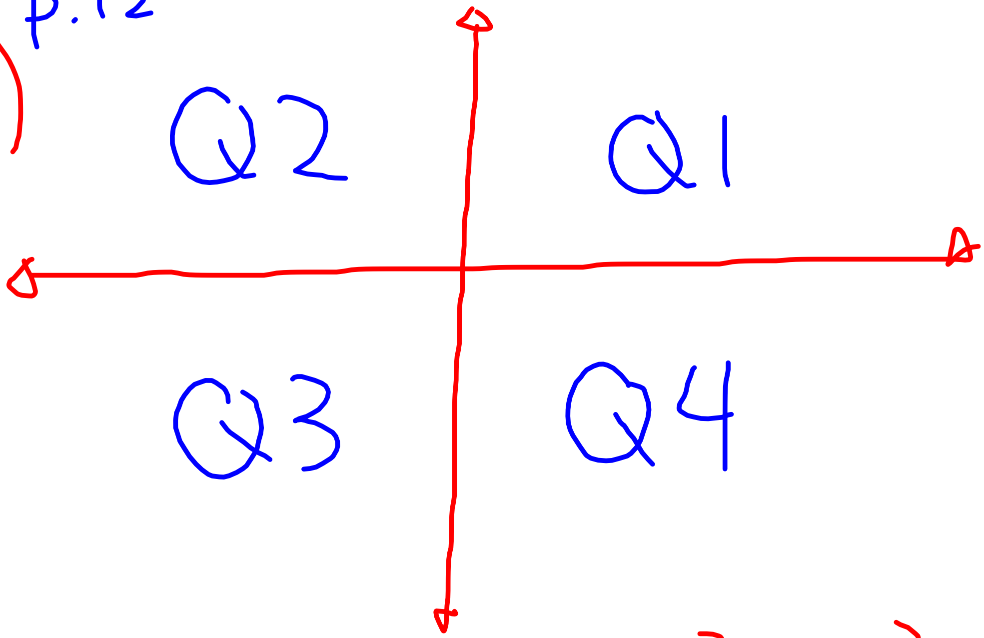
$$= \frac{3x-2}{x+5} + \frac{2(x-4)}{3(x+5)}$$

$$= \frac{3(3x-2)}{3(x+5)} + \frac{2(x-4)}{3(x+5)}$$

$$= \frac{9x - 6 + 2x - 8}{3(x+5)}$$

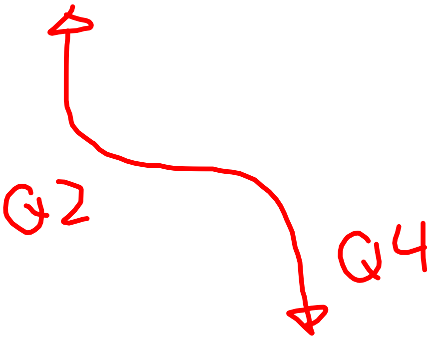
$$= \frac{11x - 14}{3(x+5)}, \quad x \neq -1, 0, -5, 3/2$$

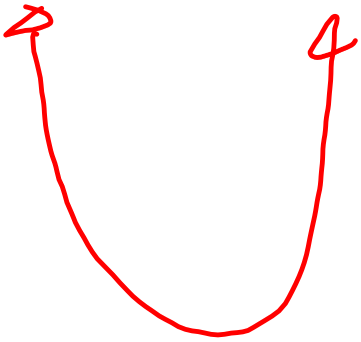
4) p. 12



$-x^3$

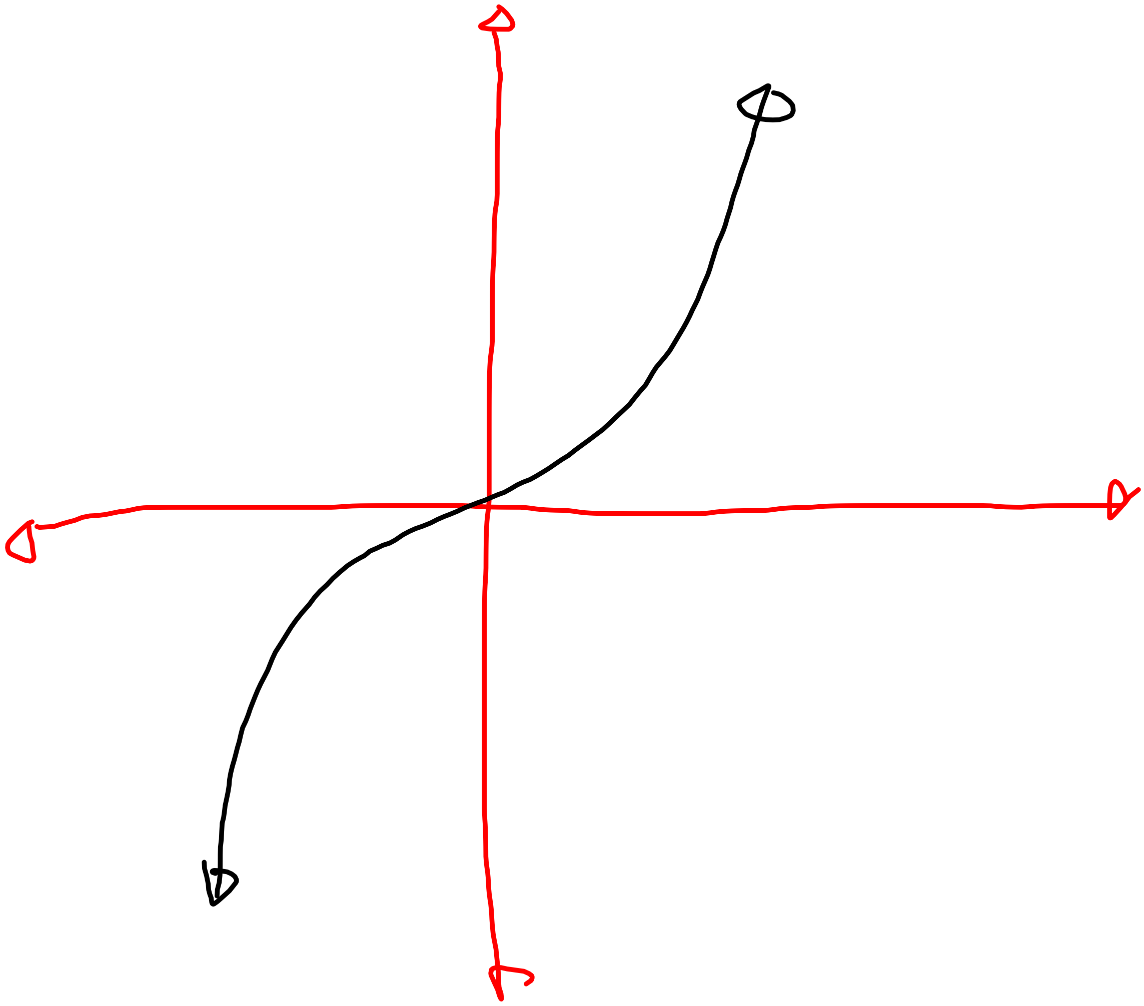
$y = 3/7\, x^2$





$-0.1x''$

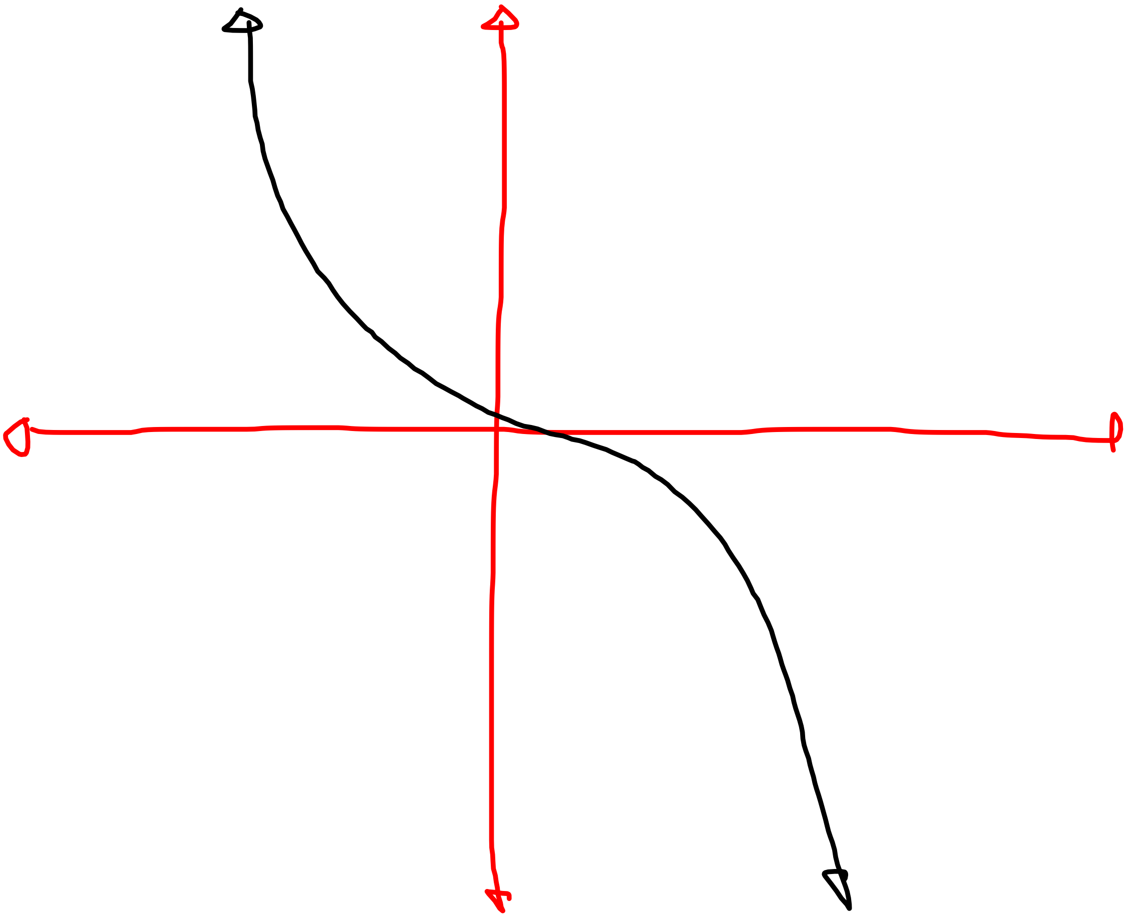
Pos odd function
$(y = x, x^3, x^5, \ldots)$



Q3 to Q1

Negative Odd Function

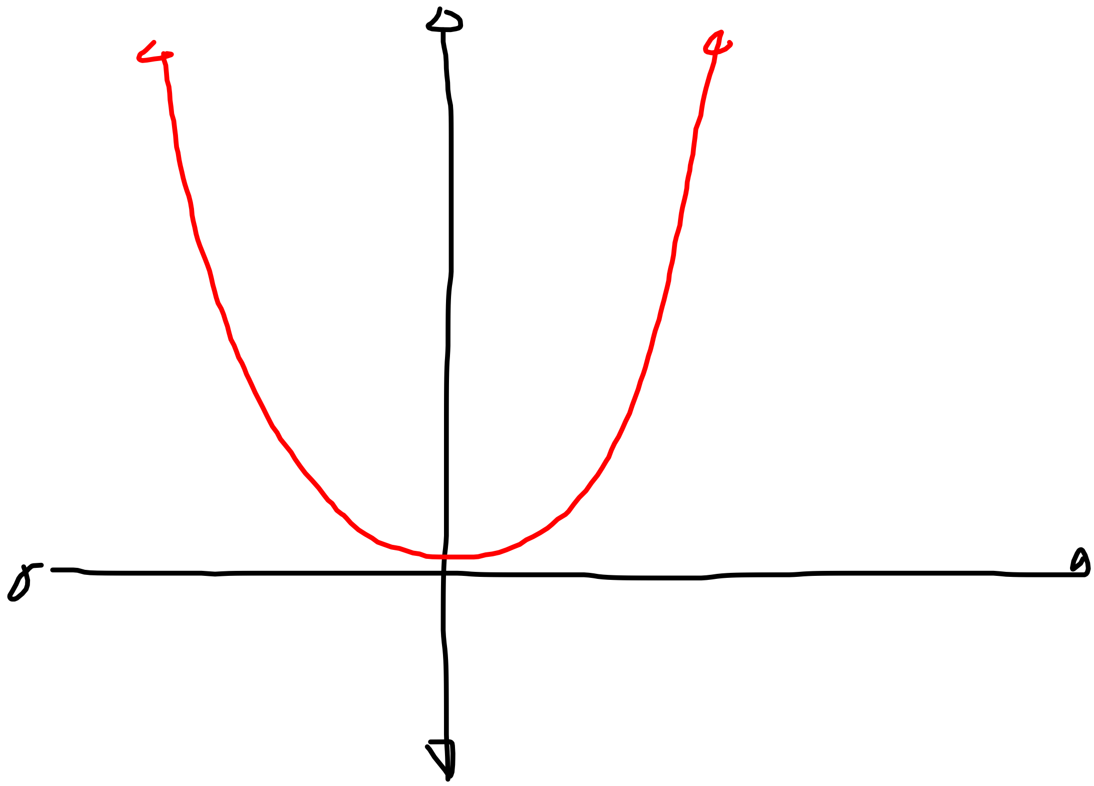
$(y = -x, -x^3, -5x^5, \ldots)$



Q2 to Q4

Positive Even Function

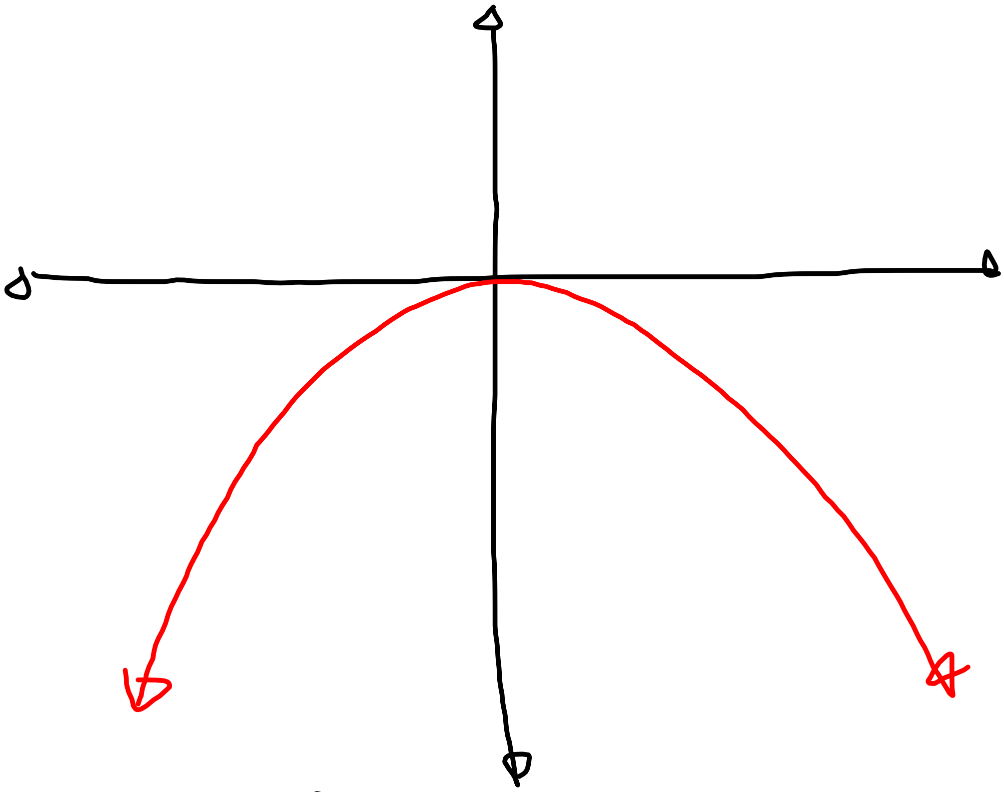
$(y = x^2, x^4, x^6, \ldots)$



Q2 to Q1

Negative Even Function

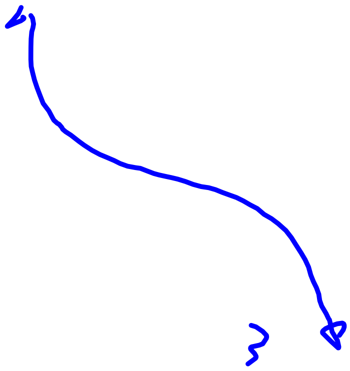
$(y = -x^2, -0.3x^4, -5x^{20}, \ldots$



Q3 to Q4

power, exponential, periodic, none

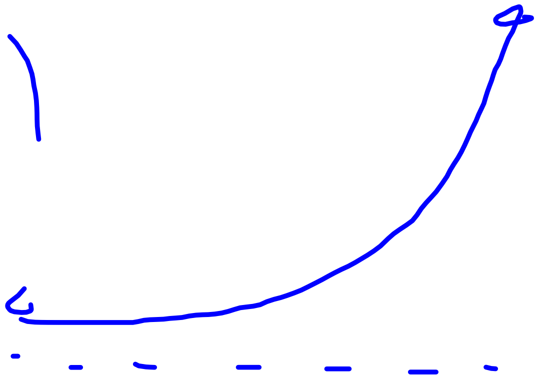
a)



$y = -x^3$

power

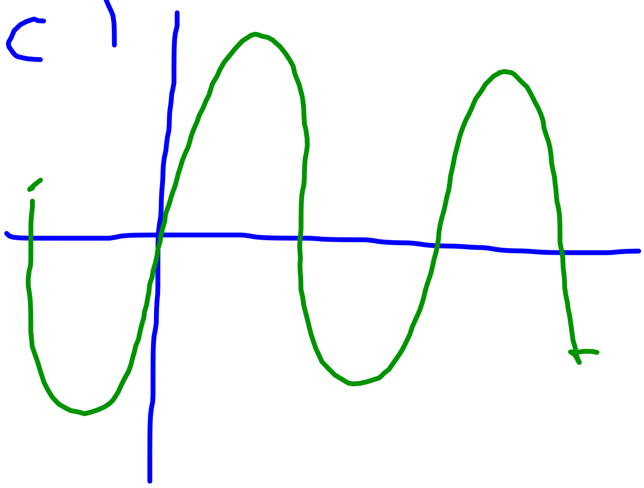
b)



$y = 2^x$

exponential

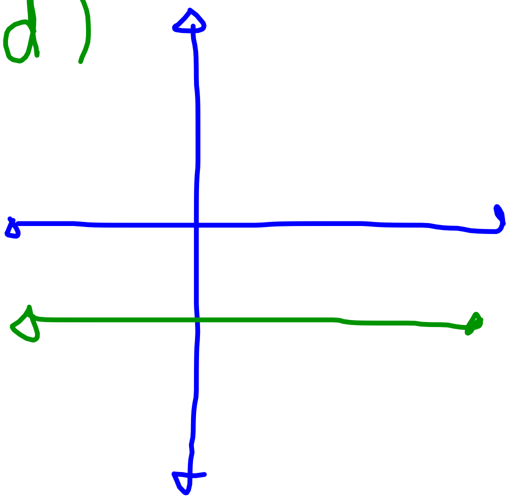
c)



$y = \sin x$

periodic

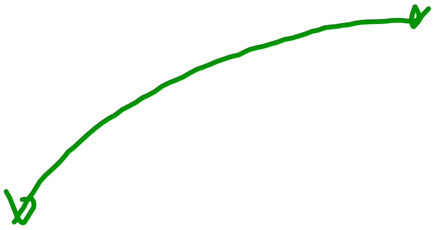
d)



$y = -3$

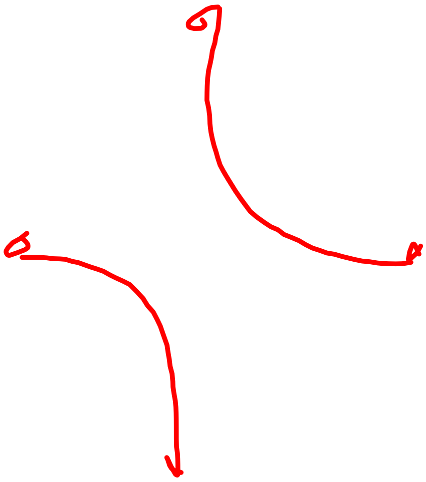
$y = -3x^0$

e)



logarithmic

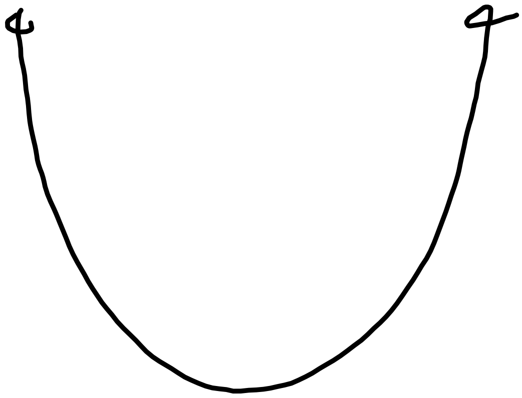
(none)



$\frac{1}{x+5}$

rational

(none)



x^2

power

$$-\frac{1}{4}(x-3)^2+5 \quad v:(3,5)$$

opens ↑

$$=-\frac{1}{4}(x^2-6x+9)+5$$

$$=-\frac{1}{4}x^2+\frac{3}{2}x-\frac{9}{4}+\frac{20}{4}$$

$$=-\frac{1}{4}x^2+\frac{3}{2}x-\frac{11}{4}$$

$a=-0.25$

$b=1.5$

$c=-2.75$

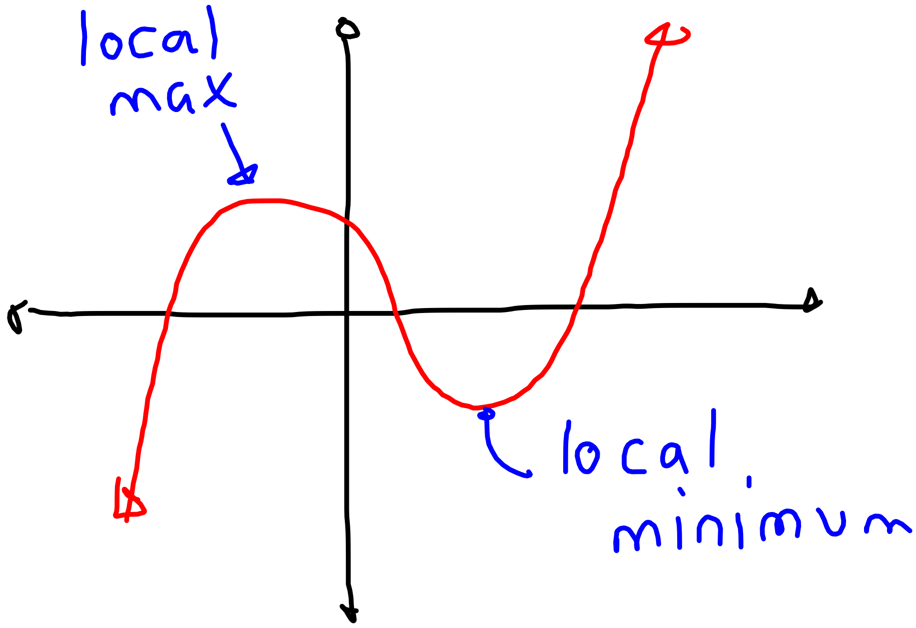
$$= -\frac{1}{4}(x^2 - 6x + 11)$$

Characteristics of Polynomial Functions

In this course we are concerned with

- end behaviour
- # of x-intercepts
- # of local maximums and local minimums

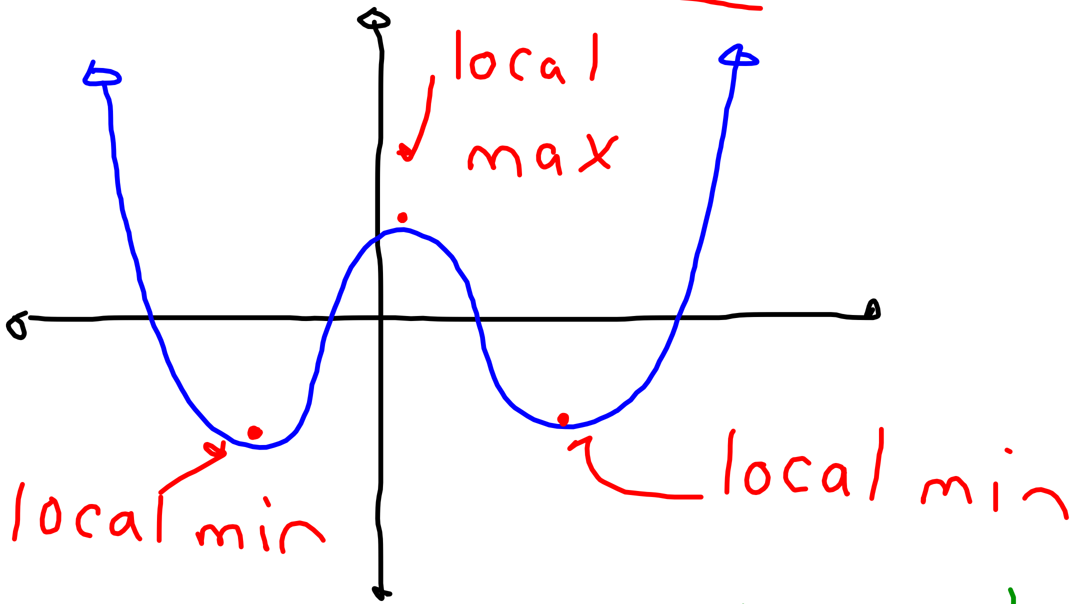
cubic function



x^3 → max 3 x-intercepts

→ max 2 local max/min

quartic function



$x^4 \rightarrow$ max 4 x-intercepts

$\rightarrow$ max 3 local extreme points (max/min)

The General Case

For an n^{th} degree function (x^n),

→ max n x-intercepts

→ $n-1$ extreme points (max/min)

ex. $x^5 - 3x^4 + 3x^3 - 2x + 1$

5 x-ints

4 max/min

Finite Differences

For a polynomial of degree n; the n^{th} differences

- are equal (or constant)
- have the same sign as the leading coefficient
- $= a \cdot n!$

$6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$4! = 4 \cdot 3 \cdot 2 \cdot 1$

Ex. 1: Determine the degree, the sign of the leading coefficient and the value of the leading coefficient:

x	y	f.d.	s.d.	t.d.
-3	-45	29	-16	6
-2	-16	13	-10	6
-1	-3	3	-4	6
0	0	-1	2	6
1	-1	1	8	6
2	0	9	14	
3	9	23		
4	32			

HW p. 26
5, 6, 8, 9, 11, 12

degree 3
pos. leading coefficient

$6 = a \cdot 3!$

$6 = a(3 \cdot 2 \cdot 1)$

$6 = a(6)$

$a = 1$

$1x^3$

$$\frac{4}{2x(x-5)(2x-3)}$$

$x \neq 0 \quad x \neq 5 \quad x \neq 3/2$