Questions From Homework

① $f(x) = x^2 + 3x - 2$ $\quad g(x) = 3x - 2$

e) $f(f(x))$

$f(x^2+3x-2) = (x^2+3x-2)^2 + 3(x^2+3x-2) - 2$

$= x^4 + 6x^3 + 5x^2 - 12x + 4 + 3x^2 + 9x - 6 - 2$

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

② b) $y = 2x^2 + 9x + 14$ Find vertex:

$y - 14 = 2x^2 + 9x$

$y - 14 + \frac{81}{8} = 2\left(x^2 + \frac{9}{2}x + \frac{81}{16}\right)$

$y - \frac{112}{8} + \frac{81}{8} = 2\left(x + \frac{9}{4}\right)^2$

$y - \frac{31}{8} = 2\left(x + \frac{9}{4}\right)^2$

$y = 2\left(x + \frac{9}{4}\right)^2 + \frac{31}{8}$

Vertex: $\left(-\frac{9}{4}, \frac{31}{8}\right)$

③ b) $y = a(x+4)(x-2)^2$

① x int ($y=0$)

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

$x = -4, 2, 2$

just touch

② y int ($x=0$)

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

$y = 16$

③ Degree = 3rd

④ Stretch Factor

$a = 1$ (Positive)

Starts in Q3 + Ends in Q1

⑤ Approx Local Max ($x=-1$)

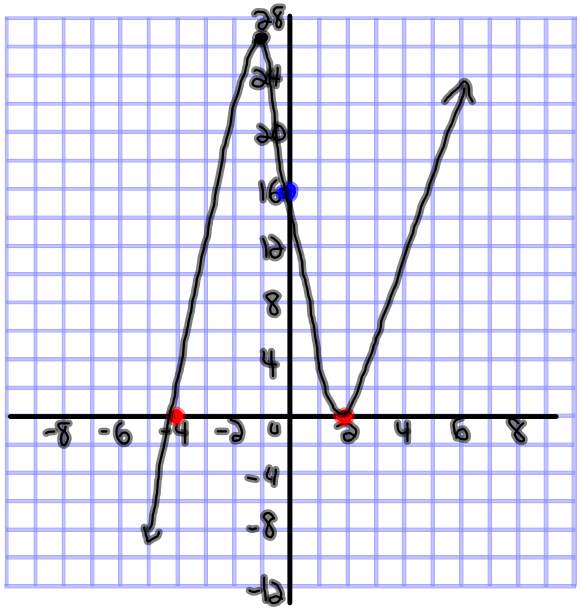
$y = (x+4)(x-2)^2$

$y = (-1+4)(-1-2)^2$

$y = (3)(9)$

$y = 27$

$(-1, 27)$



Polynomial Functions

Polynomial - an algebraic expression consisting of two or more terms. A polynomial usually contains only one variable. Within each term the variable is raised to a non-negative integer power, and is multiplied by a constant. The simplest types of polynomials are binomials (two terms) and trinomials (three terms)

Degree of a Polynomial - the greatest power to which the variable is raised; for example, the degree of the trinomial $x^4 - 2x + 5$ **is 4**

A *polynomial* function with real coefficients can be represented by

$$y = f(x) = ax^n + bx^{n-1} + cx^{n-2} + \ldots + x^0$$

where *a, b, c, etc.* are real numbers. The shape of the graph of the function is affected by the value of *n* (*the Degree of the Polynomial*), the values of the cooefficients, and whether the value of *a* is positive or negative.

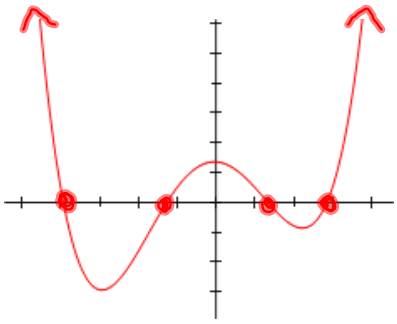
Quartic Functions

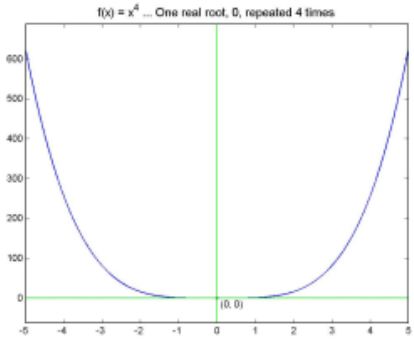
4th Degree Polynomials. $y = ax^4 + bx^3 + cx^2 + dx + e$

factored form $y = a(x - r_1)(x - r_2)(x - r_3)(x - r_4)$

They can have up to 4 roots

a > 0 (Positive) Starts in Q2
Ends in Q1





a < 0 (Negative) Starts in Q3
Ends in Q4

A quartic function has four roots. Either four roots, two roots, or no roots are real numbers. Any other roots are complex numbers. The number of *x-intercepts* on the graph of the corresponding quartic function *y= f(x)* depends on the nature of the roots.

Four different real roots

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

① Degree = 4th

② x int (y=0)

$0 = (x-3)(x-1)(x+1)(x+2)$

$x = 3, 1, -1, -2$

③ y int (x=0)

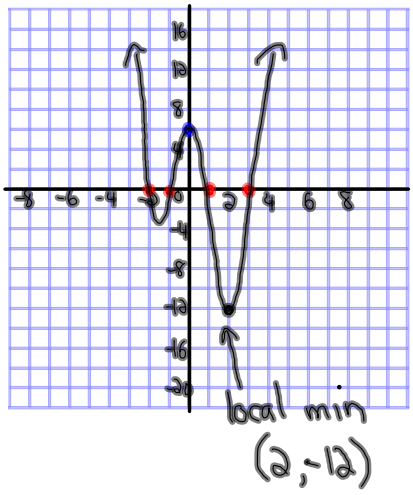
$y = (-3)(-1)(1)(2)$

$y = 6$

④ Stretch Factor

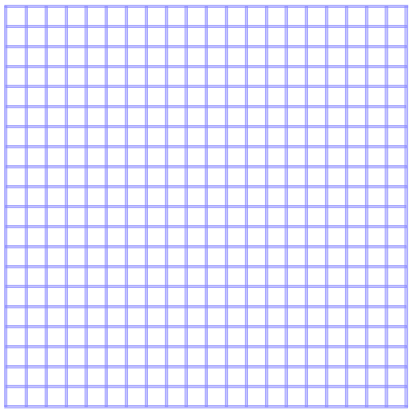
$a = 1$ (Positive)

Starts in Q2 + Ends in Q1



Two real unequal and two complex roots.

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



Two different real roots and two equal real roots

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

① Degree = 4th

② x int (y = 0)

$0 = (x-3)(x-1)(x+2)(x+2)$

$x = 3, 1, -2, -2$

Double root

③ y int (x = 0)

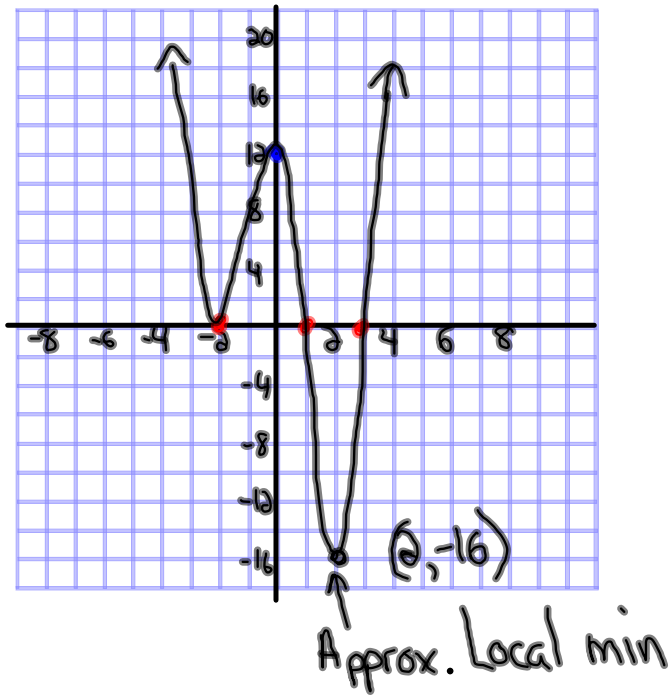
$y = (-3)(-1)(2)^2$

$y = 12$

④ Stretch Factor

$a = 1$ (Positive)

Starts in Q2 + Ends in Q1



Local Maximum - is the highest point in its immediate region of *x-values.*
This may or may not be the greatest value of the function over its entire domain.

Local Minimum - is the lowest point in its immediate region of *x-values.*
This may or may not be the smallest value of the function over its entire domain.

Calculating Max and Min values on the TI-83

Homework