Questions From Homework

③ a) $y = (x+2)(x+3)(x-2)$ a=1

3rd Degree Polynomial with a positive stretch

(i) Roots (y=0)

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

$\boxed{x = -3, -2, 2}$

(ii) y intercept (x=0)

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

$\boxed{y = -12}$

(iii) Local max (x=-2.5)

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

$y = (-0.5)(0.5)(-4.5)$

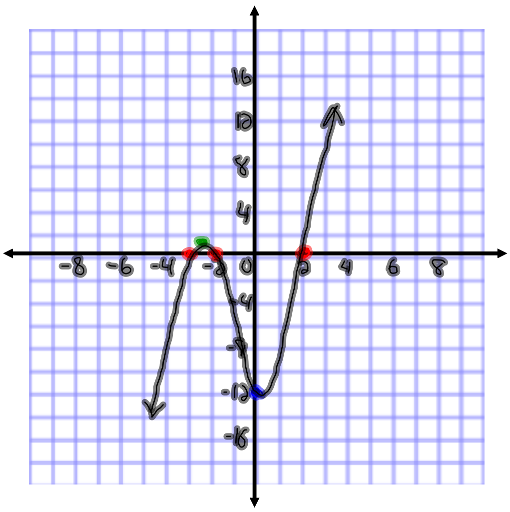
$y = 1.125$

$\boxed{(-2.5, 1.125)}$

Local min (x=0)

$y = -12$

$\boxed{(0, -12)}$



③ d) $y = (x-2)(\underline{x^2+7x+10})$ a=1

3rd Degree positive stretch

$y = (x-2)(\underline{(x+2)(x+5)})$

① Roots:

$\boxed{x = -5, -2, 2}$

② y int:

$\boxed{y = -20}$

Questions From Homework

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

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) $y = 2x^2 + 9x + 14$ $\qquad \boxed{\text{Find vertex:}}$

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

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

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

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

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

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

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

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

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

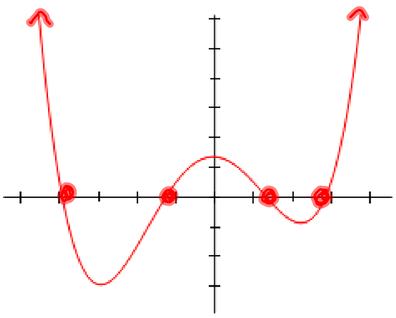
4th Degree Polynomials. $y = ax^4 + bx^3 + cx^2 + dx + e$

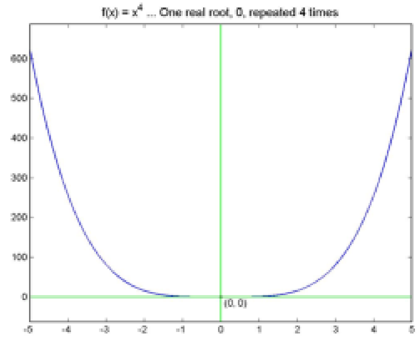
factored form $y = a(x - r_1)(x - r_2)(x - r_3)(x - r_4)$

stretch

a > 0

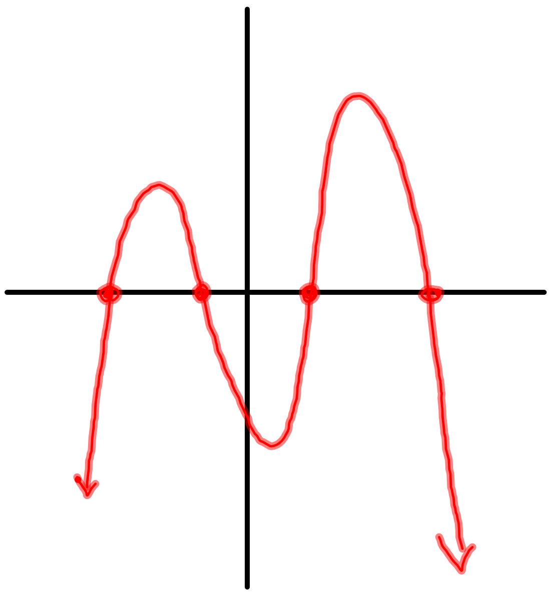
Starts in Q2
Ends in Q1





a < 0

Starts in Q3
Ends in Q4

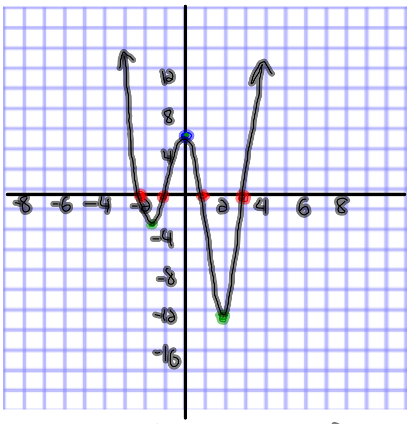


A quartic function has four roots. Either four roots, two roots, or no roots are real numbers. Any other roots are complex numbers. The number of *x-intercepts* on the graph of the corresponding quartic function *y= f(x)* depends on the nature of the roots.

Four different real roots

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

4th Degree → (a = 1)



① Roots:

$\boxed{x=-2,-1,1,3}$

② y intercept:

$\boxed{y=6}$

③ Local min (x=-1.5)

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

$y=(-4.5)(-2.5)(-0.5)(0.5)$

$y=-2.8125$

$\boxed{(-1.5,-2.8125)}$

④ Local min (x=2)

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

$y=(-1)(1)(3)(4)$

$y=-12$

$\boxed{(2,-12)}$

Local Max (x=0)

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

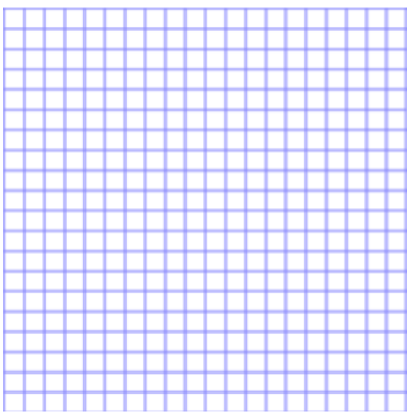
$y=(-3)(-1)(1)(2)$

$y=6$

$\boxed{(0,6)}$

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 = 4^{th}

② $\boxed{x\text{int } (y=0)}$

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

$x = 3, 1, \boxed{-2, -2}$

Double root

③ $\boxed{y\text{int } (x=0)}$

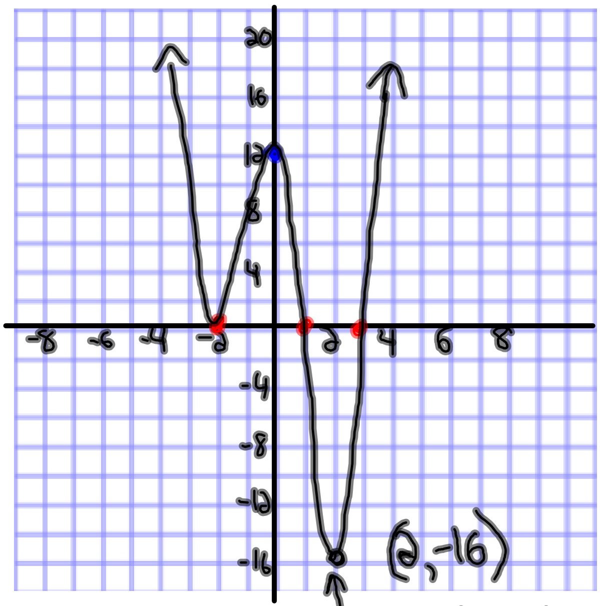
$y = (-3)(-1)(2)^2$

$y = 12$

④ $\boxed{\text{Stretch Factor}}$

$a = 1$ (Positive)

Starts in Q2 + Ends in Q1



Approx. Local min

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