

Functions Toolkit 1

1. Factor Completely

a) $x^4 - 28x^2 + 36$

$$(x^4 - 12x^2 + 36) - 16x^2$$

$$(x^2 - 6)^2 - 16x^2$$

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

Find the missing term
 $\sqrt{36} = 6 \cdot 2 = \underline{\underline{12}}$

b) $9x^4 + 38x^2 + 49$

$$(9x^4 + 42x^2 + 49) - 4x^2$$

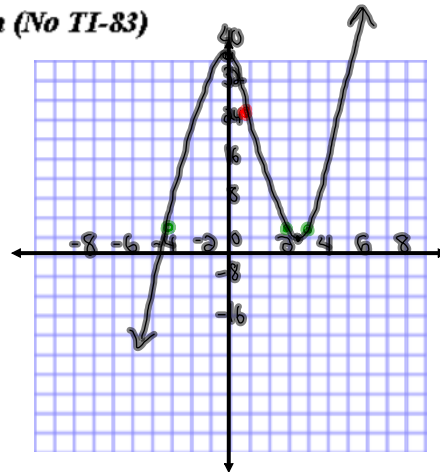
$$(3x^2 + 7)^2 - 4x^2$$

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

Find the missing term
 $\sqrt{441} = 21 \cdot 2 = \underline{\underline{42}}$

2. For the following: $y = x^3 - x^2 - 14x + 24$

- Use the *Factor Theorem* to factor the function.
- State the *Roots* of the function
- Find the *y intercept*
- State the approximate *Local Maximum (No TI-83)*
- State the approximate *Local Minimum (No TI-83)*
- Sketch the function



a) Find a value of "x" that makes it equal 0

$$y = x^3 - x^2 - 14x + 24$$

$$y = (2)^3 - (2)^2 - 14(2) + 24$$

$$y = 8 - 4 - 28 + 24$$

$$y = 0 \rightarrow (x-2) \text{ is a factor}$$

$$\begin{array}{r} x^2 + x - 12 \\ \underline{x-2} \\ x^3 - x^2 - 14x + 24 \\ - (x^3 - 2x^2) \\ - x^2 - 14x + 24 \\ - (x^2 - 2x) \\ - 12x + 24 \\ - (-12x + 24) \\ 0 \end{array}$$

$$y = (x-2)(x^2 + x - 12)$$

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

b) Roots (x-int):

$$x = -4, 2, 3$$

c) y int:

$$y = 24$$

d) App. Local Max. (x=-1)

$$y = (-1-2)(-1-3)(-1+4)$$

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

$$y = 36 \quad (-1, 36)$$

App. Local Min (x=2.5)

$$y = (2.5-2)(2.5-3)(2.5+4)$$

$$y = (0.5)(-0.5)(6.5)$$

$$y = -1.625 \quad (2.5, -1.625)$$

3. Solve the following inequality and express your answer using *Interval Notation* $x^3 - 9x \leq x^2 - 9$

$$x^3 - x^2 - 9x + 9 \leq 0$$

less than or equal to \leq
"negative y values"

① Factor + State roots:

$$y = (x^3 - x^2)(-9x + 9)$$

$$y = x^2(x-1) - 9(x-1)$$

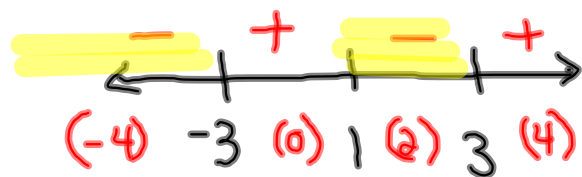
$$y = (x-1)(x^2 - 9)$$

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

Roots:

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

② Number Line / Test Values



③ State Intervals:

$$x \in (-\infty, -3] \cup [1, 3]$$

