⑦ d) $x^4 - 10x^2 + 9 \leq 0$

$y = x^4 - 10x^2 + 9$

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

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

(-)(-)(-)(-)
(-)(-)(+)(-)
(+)(-)(+)(-)
(+)(+)(+)(-)
(+)(+)(+)(+)

① Roots: $(y=0)$

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

②/③

+ | − | + | − | +

(-4) -3 (-2) -1 (0) 1 (2) 3 (4)

④ $x \in [-3, -1] \cup [1, 3]$

① c) $x^3 - 8 \geq x^2 + 10x$

$$x^3 - x^2 - 10x - 8 \geq 0$$

$$y = x^3 - x^2 - 10x - 8$$

$$y = (-1)^3 - (-1)^2 - 10(-1) - 8$$

$$y = -1 - 1 + 10 - 8$$

$$y = 0$$

$$\begin{array}{r|rrrr} -1 & 1 & -1 & -10 & -8 \\ & & -1 & 2 & 8 \\ \hline & 1 & -2 & -8 & \end{array}$$

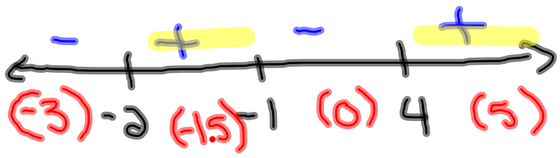
$$y = (x+1)(x^2 - 2x - 8)$$

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

① Roots:

$\boxed{x = -2, -1, 4}$

② Number Line / Test Values



③ State Intervals

$x \in [-2, -1] \cup [4, \infty)$

Review #1

① g) $9x^4+\underline{26x^2}+25$ $* \sqrt{9 \cdot 25}$

$\sqrt{225} = 15 \cdot 2 = \underline{30}$

$(9x^4+30x^2+25)-4x^2$

$(3x^2+5)(3x^2+5)-4x^2$

$\boxed{(3x^2+5)^2}-\boxed{4x^2}$

$(\underline{3x^2+5}-\underline{2x})(\underline{3x^2+5}+\underline{2x})$

$(3x^2-2x+5)(3x^2+2x+5)$

④ $f(x)=2x^2+5$ $g(x)=x-3$

a) $f(g(x))$

$f(x-3) = 2(x-3)^2+5$

$= 2(x^2-6x+9)+5$

$= 2x^2-12x+18+5$

$= 2x^2-12x+23$

④ $f(x)=2x^2+5$ $g(x)=x-3$

d) $g(f(-3))$

$f(-3)=2(-3)^2+5$

$= 18+5$

$= 23$

$g(23) = 23-3$

$= \boxed{20}$

③ $y = x^3 - 4x^2 + x + 6$

a) $(x-2)$ is a factor

$$\begin{array}{r} x^2 - 2x - 3 \\ x-2 \overline{\big)\, x^3 - 4x^2 + x + 6} \\ -(x^3 - 2x^2) \quad\quad\quad \\ \hline -2x^2 + x \quad\quad \\ -(-2x^2 + 4x) \quad\quad \\ \hline -3x + 6 \\ -(-3x + 6) \\ \hline 0 \end{array}$$

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

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

b) Roots

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

c) y int

$\boxed{y = 6}$

d) local max $(x=0.5)$

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

$y = (-1.5)(-2.5)(1.5)$

$y = 5.625$

approx. $(0.5, 5.625)$

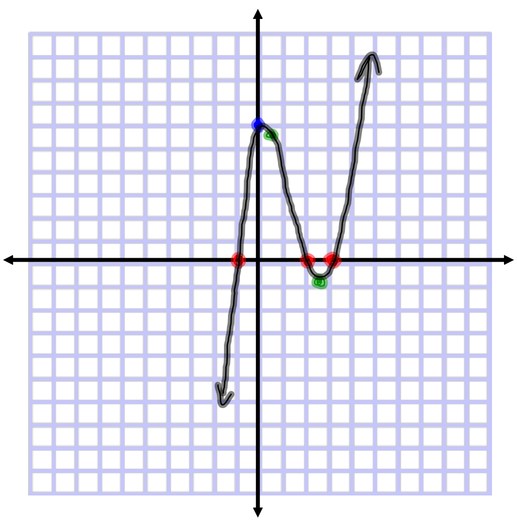
e) local min $(x=2.5)$

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

$y = (0.5)(-0.5)(3.5)$

$y = -0.875$

$(2.5, -0.875)$



3rd Degree Polynomial with a positive stretch factor

⑤ $x^2 + x \geq 30$

$x^2 + x - 30 \geq 0$

y values are greater than or equal to 0

$y = x^2 + x - 30$

$y = (x-5)(x+6)$

① Roots: $(y=0)$

$x - 5 = 0$ | $x + 6 = 0$

$x = 5$ | $x = -6$

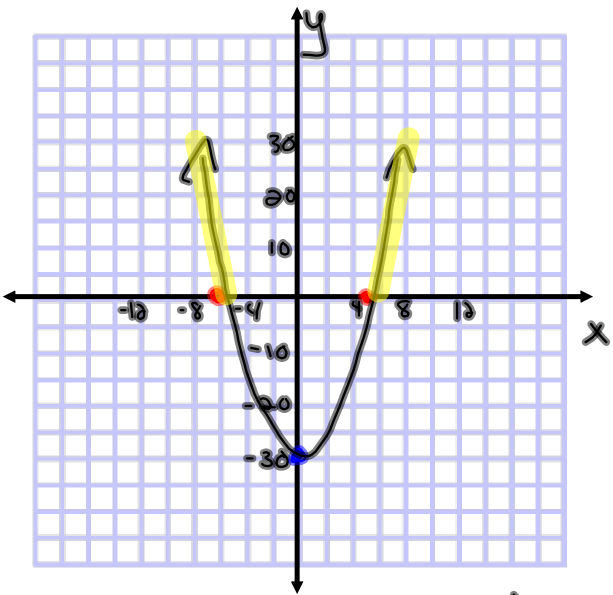
② y int $(x=0)$

$y = -30$

③ 2nd Degree ↑∪↑

$a = 1$

④



$x \in (-\infty, -6] \cup [5, \infty)$

⑥ $x^3+x^2<16x+16$

$x^3+x^2-16x-16<0$

y values are negative

① $y=(x^3+x^2)(-16x-16)$

$y=x^2(x+1)-16(x+1)$

$y=(x+1)(x^2-16)$

$y=(x+1)(x+4)(x-4)$

$x=-4,-1,4$

② $\underset{(-5)}{-}\quad -4 \quad \underset{(-2)}{+}\quad -1 \quad \underset{(0)}{-}\quad 4 \quad \underset{(5)}{+}$

$x\in(-\infty,-4)\cup(-1,4)$

③ a) $y = x^3 - 4x^2 + x + 6$

$x = -1$

$y = (-1)^3 - 4(-1)^2 + (-1) + 6$

$x+1$ is a factor

$y = -1 - 4 - 1 + 6$

$y = 0$

$-1 \,\rfloor$

1	-4	1	6
	-1	5	-6
1	-5	6	

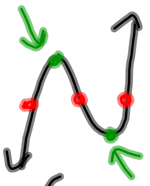
$y = (x+1)(x^2 - 5x + 6)$

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

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

c) $y = 6$

d) 3rd Degree / $a = 1$



Approx Local Max $(x = 0.5)$

$y = (1.5)(-1.5)(-2.5)$

$y = 5.6$

e) Approx Local Min $(x = 2.5)$

$y = (3.5)(0.5)(-0.5)$

$y = 0.88$

①d) $8x^2-2x-3$

$\underline{-6} \times \underline{4} = -24$

$\underline{-6} + \underline{4} = -2$

$(8x^2 -6x)(+4x-3)$

$2x(4x-3)+1(4x-3)$

$(4x-3)(2x+1)$

Factoring:

① Try to take out a common factor

② Count the terms

↳ 2 terms → • Diff of Squares
- • Diff of Cubes
- • Sum of Cubes

↳ 3 terms → • Simple Trinomial
- • Decomposition
- • Perfect Square Trinomial
- • Find the Missing Term

↳ 4 terms → • Group for a common Factor
- • " " " Diff of Squares

③ If these techniques don't work try "Factor theorem" or "synthetic sub."