1)

$f(x) = x^3 + ax^2 + b$

$f(2) = 8 + 4a + b$

$8 + 4a + b = 3$

$8 - 12 + b = 3$

$\boxed{b = 7}$

$f'(x) = 3x^2 + 2ax$

$f'(2) = 12 + 4a$

$12 + 4a = 0$

$4a = -12$

$\boxed{a = -3}$

2)

$f'(x) = x(x-3)^2(x+1)^4 = 0$

$x = 0 \quad x = 3 \quad x = -1$

f': $-$ $-$ $+$ $+$

$-1 \quad 0 \quad 3$

$f(x)$ has ONE MIN @ $x = 0$

3)

$y' < 0$ @ points C & D

b/c y is decreasing

$y'' < 0$ @ points A, B, C

b/c y is concave down

$\therefore$ $y' < 0$ & $y'' < 0$ @ point C

4)

$y = x^2 - 4x + 3 \quad [0, 5]$

END point

$x = 0$

$x = 5$

$y' = 2x - 4$

$2x - 4 = 0$

$x = 2$

x	y
0	3
2	-1
5	8

y has abs. max of $y = 8$ @ $x = 5$.

5)

$y = 2x^3 - 3x^2 - 12x$

$y' = 6x^2 - 6x - 12 = 0$

$x^2 - x - 2 = 0$

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

$x = 2 \quad x = -1$

y': $+$ $-$ $+$

$-1 \quad 2$

- y has a local max @ $x = -1$ b/c y' Δs signs from $+$ to $-$.
- y has a local min @ $x = 2$ b/c y' Δs signs from $-$ to $+$.

6)

$y = x^4 - 4x^3$

$y' = 4x^3 - 12x^2$

$y'' = 12x^2 - 24x = 0$

$12x(x-2) = 0$

$x = 0 \quad x = 2$

y'': $+$ $-$ $+$

$0 \quad 2$

$y(0) = 0 \quad y(2) = -16$

y has P.o.I @ $(0,0)$ & $(2,-16)$ b/c y'' Δs signs.

7)

$f(x) = x^4 - 4x^2$

$f'(x) = 4x^3 - 8x = 0$

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

$x = 0 \quad x = \pm\sqrt{2}$

$-$ $+$ $-$ $+$

$-\sqrt{2} \quad 0 \quad \sqrt{2}$

(A) 1 max, 2 min

8) point F, since *f* has a horizontal tangent and is concave down

9) point B, since *f* is increasing at a point of inflection

10) point G, since *f* is decreasing and concave down

11) point E, since *f* is increasing and concave up