

Exercise: Sketch

$$f(x) = \begin{cases} -x^2 - 2x + 1 & x < -1 \\ 2 & -1 < x \leq 1 \\ (x-1)^2 + 2 & x > 1 \end{cases}$$

$$y = -x^2 - 2x + 1$$

$$\text{vertex: } x = \frac{-b}{2a} = \frac{-(-2)}{2 \times -1} = \frac{2}{-2} = -1$$

$$\hookrightarrow y = -(-1)^2 - 2 \times (-1) + 1 \Rightarrow (-1, 2) \\ = -1 + 2 + 1 = 2$$

$$y\text{-int } \xrightarrow{x=0} y=1 \quad (0, 1)$$

$y=2$  Horizontal line

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

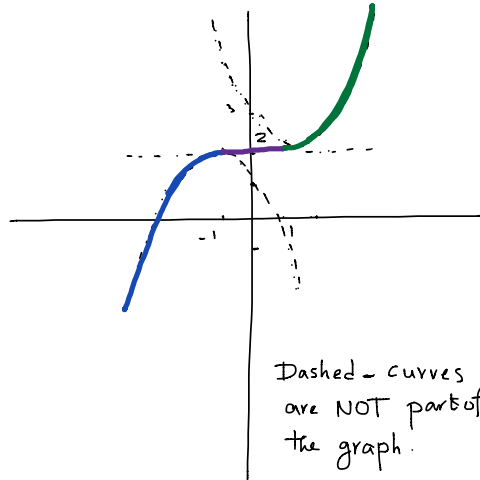
we can expand the square to write the function  
in the form  $y = ax^2 + bx + c$

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

$$x = \frac{-b}{2a} = \frac{-(-2)}{2 \times 1} = \frac{2}{2} = 1 \Rightarrow \text{vertex } (1, 2)$$

$$\hookrightarrow y = 1^2 - 2 \times 1 + 3 = 1 - 2 + 3 = 2$$

$$y\text{-int } \xrightarrow{x=0} y=3 \quad (0, 3)$$



Dashed curves  
are NOT part of  
the graph.