

(1) [5] Let  $f(x) = 1/x$ . Evaluate and simplify the difference quotient

$$\begin{aligned} & \frac{f(x) - f(a)}{x - a} \\ &= \frac{\frac{1}{x} - \frac{1}{a}}{x - a} \\ &= \frac{\left(\frac{a-x}{ax}\right)}{x-a} \\ &= -\frac{\cancel{(x-a)}}{ax} \cdot \frac{1}{\cancel{(x-a)}} \\ &= \boxed{\frac{-1}{ax}} \end{aligned}$$

(2) [5] Find an expression for the function whose graph is the bottom half of the parabola

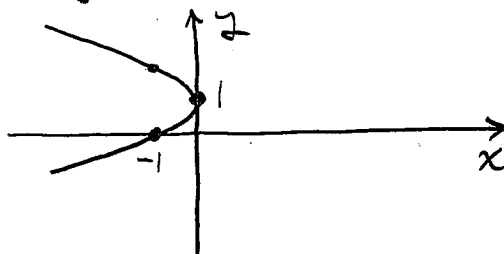
$$x + (y-1)^2 = 0$$

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

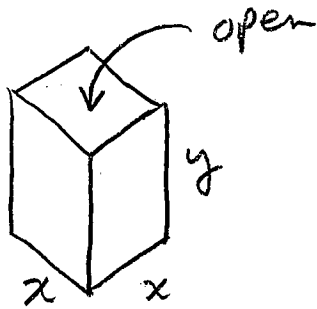
$$y-1 = -\sqrt{-x}$$

$$\boxed{y = 1 - \sqrt{-x}}$$

Note: Graph of  $x + (y-1)^2 = 0$  is



(3) [5] An open rectangular box of volume  $2 \text{ m}^3$  has a square base of side length  $x$ . Express the surface area  $S$  of the box as a function of  $x$ .



$$V = x^2 y = 2$$

$$\therefore y = \frac{2}{x^2}$$

$$S = x^2 + 4xy$$

↑ area of base  
↑ area of 4 sides

$$\therefore S = x^2 + 4x \left( \frac{2}{x^2} \right)$$

$$S = x^2 + \frac{8}{x}$$