(1)[5 points] Let $f(x) = \frac{1}{x}$. Evaluate and simplify

$$\frac{f(x) - f(a)}{x - a}.$$

$$= \frac{\frac{1}{x} - \frac{1}{a}}{x-a}$$

$$= \frac{1}{x-a}\left[\frac{1}{x} - \frac{1}{a}\right]$$

$$= \frac{1}{x-a}\,\frac{a-x}{ax}$$

$$= \frac{1}{\cancel{(x-a)}} \cdot \frac{-\cancel{(x-a)}}{ax}$$

$$= \frac{-1}{ax}$$

(2)[5 points] Find the domain of

$$f(x) = \frac{x}{3x-1}$$

Domain is all real x for which $3x-1 \neq 0$,
i.e. all real $x \neq \frac{1}{3}$.

or $\quad (-\infty, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$

(3)[5 points] Sketch the graph of

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

Be sure to label and indicate the scale on the x and y axes.