1. Graphs will vary, but cannot be continuous on the interval $[0,2]$.

If the graph was continuous on $[0,2]$, the intermediate value theorem tells us there is some c between 0 and 2 with $f(c) = 3$.

2. $$f(x) = \begin{cases} x^2 & \text{if } x<1 \\ ax+b & \text{if } 1 \le x \le 2 \\ \frac{x^2+1}{x-1} & \text{if } x>2 \end{cases}$$

Since each piece-wise component of $f(x)$ is continuous on its domain, we need only check continuity at $x=1$ and $x=2$.

$$\left.\begin{aligned} &\lim_{x\to 1^-} f(x) = \lim_{x\to 1^-} x^2 = 1 \\ &f(1) = a+b \end{aligned}\right\} \text{So: } a+b=1$$

$$\left.\begin{aligned} &\lim_{x\to 2^+} f(x) = \lim_{x\to 2^+} \frac{x^2+1}{x-1} = 5 \\ &f(2) = 2a+b \end{aligned}\right\} \text{So: } 2a+b=5$$

$$\begin{array}{r} 2a+b = 5 \\ -\,(a+b = 1) \\ \hline a = 4 \end{array}$$

and $b = 1-a = -3$.

LG P3