1. (3 points) Let $f(x) = \sin\left(\dfrac{\pi x}{6}\right) - x^2$. Find the average rate of change in the function between $x = 1$ and $x = 3$. *Your answer should be a number.*

   Solution:

   $$f(3) = \sin\left(\frac{3\pi}{6}\right) - (3)^2 = -8$$

   and

   $$f(1) = \sin\left(\frac{\pi}{6}\right) - (1)^2 = -1/2$$
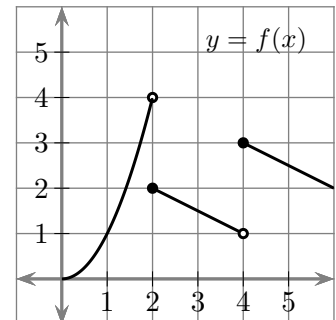
   It follows that

   $$f_{\text{avg}} = \frac{f(3) - f(1)}{3 - 1} = \frac{-15}{4}$$

2. (4 points) Let $y = f(x)$ as shown. Compute the limits that follow (or explain why they do not exist).

   (a) $\lim\limits_{x \to 2} f(x) = $ DNE since the LHL $\neq$ RHL

   (b) $\lim\limits_{x \to 4^-} f(x) = 1$

   A few comments: Notice that $\lim_{x \to 4^+} f(x) = 3$ so that $\lim_{x \to 4} f(x) = $ DNE.

3. (3 points) Evaluate the limit below.

   $$\lim_{x \to 5^-} \frac{|x - 5|}{x - 5} =$$

   Can the Quotient Rule (of the Limit Laws) be used for the above limit? No

   Solution:

   Since $x < 5$ we have

   $$\lim_{x \to 5^-} \frac{|x - 5|}{x - 5} = \lim_{x \to 5^-} \frac{-(x - 5)}{x - 5} = \lim_{x \to 5^-} -1 = -1$$