- 8. [10 points] You do not need to show work in this problem, but limited partial credit may be awarded for work shown.
  - **a**. [5 points] Consider the rational function:

$$q(x) = \frac{2(x-1)(x-5)}{(x+3)(x-1)}.$$

Find the following, or write NONE if none exist.

- i. the (x, y)-coordinates of any hole(s): (3,27/28)
- ii. the **equations** of any horizontal asymptote(s): y = 0
- iii. the **equations** of any vertical asymptotes(s): x = -4, x = 1
- **b**. [5 points] Find the following limits. Each answer may be  $\infty$ ,  $-\infty$ , a number, or NEI if there is not information to determine it.
  - i.  $\lim_{x \to 0^-} \frac{1}{x} = -\infty$
  - ii.  $\lim_{x \to \infty} \ln(x) =$ \_\_\_\_\_
  - iii.  $\lim_{x \to \infty} \frac{e^x}{x^e} = \_\_$
  - iv.  $\lim_{x \to \infty} \frac{2^x}{3^x} = ----0$
  - v. for a quadratic function q(x) and a polynomial p(x) of degree 3,

$$\lim_{x \to \infty} \frac{q(x)}{p(x)} = - 0$$