

8. [10 points] Let  $A$  and  $B$  be **positive** constants. The rational functions  $y = P(x)$  and  $y = Q(x)$  are given by the following formulas:

$$P(x) = \frac{5x(x-2)(Ax+1)^2}{(3x^2+B)(x^2-9)} \quad Q(x) = \frac{P(x)(x-3)}{x-2}$$

Your answers below may depend on the constants  $A$  and  $B$  and should be in exact form. You do not need to show your work.

- a. [3 points] Find the zeros of the function  $y = P(x)$ . If  $P$  has no zeros write “NONE”.

**Answer:** \_\_\_\_\_

- b. [2 points] What is the domain of  $P(x)$ ?

**Answer:** \_\_\_\_\_

- c. [2 points] Find the *equation(s)* of the horizontal asymptote(s) of  $y = P(x)$ . If it has no horizontal asymptotes, write “NONE”.

**Answer:** \_\_\_\_\_

- d. [3 points] If  $A = 1$ , find the values of  $c$  where  $\lim_{x \rightarrow c} Q(x)$  does not exist. If no such values of  $c$  exist, write “NONE”.

**Answer:**  $c =$  \_\_\_\_\_