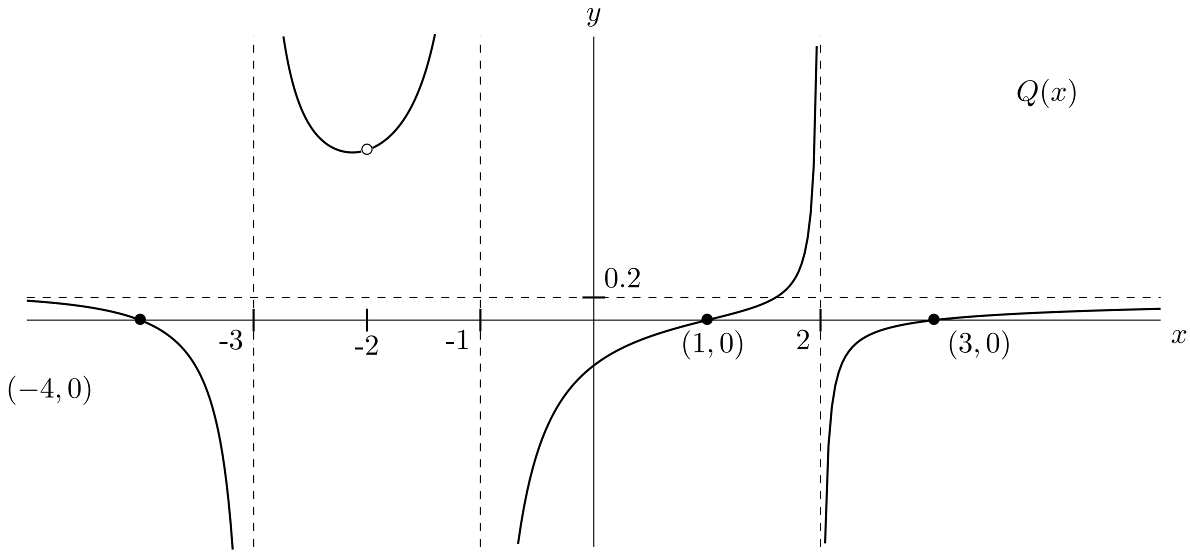
3. [10 points]
Below is the graph of a rational function $Q(x)$. Note that

- $Q(x)$ has a horizontal asymptote at $y = 0.2$
- $Q(x)$ has zeros at $x = -4$, $x = 1$, and $x = 3$
- $Q(x)$ has a hole at $x = -2$
- $Q(x)$ has vertical asymptotes at $x = -3$, $x = -1$, and $x = 2$

Using the information in the portion of the graph shown, write a possible formula for $Q(x)$. You do not need to simplify your answer.



Solution: Since there are vertical asymptotes at $x = -3$, $x = -1$ and $x = 2$, we have that we must have $(x+3)(x+1)(x-2)$ in the denominator. Similarly with the zeros, we determine that $(x+4)(x-1)(x-3)$ is in the numerator.
There hole at $x = -2$, but the hole is not a zero. This means that the numerator and the denominator both have equal amounts of $(x+2)$ factors.
Finally, a horizontal asymptote at $y = 0.2$ implies that the degrees of both the numerator and denominator agree, and that the fraction of their leading coefficients is 0.2. Putting it all together, we can construct a possible formula of the form

$$Q(x) = \frac{0.2(x+4)(x-1)(x-3)(x+2)}{(x+3)(x+1)(x-2)(x+2)}$$

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