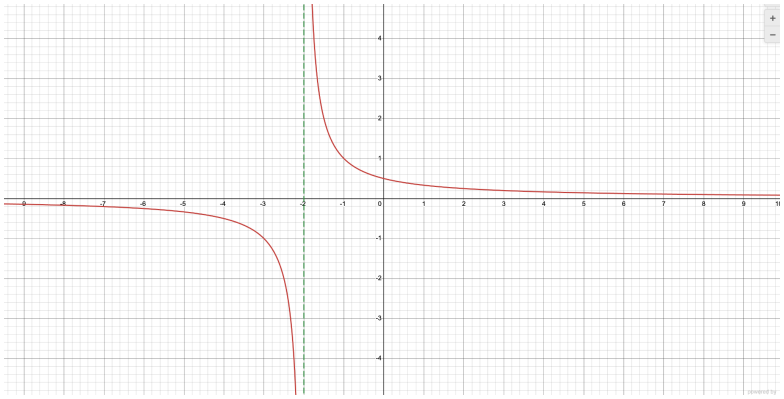
Rational Functions & Asymptotes

Name: _____KEY_____ Date: _____

1. Use this GeoGebra applet: https://www.geogebra.org/m/Fsnt4mRk to create the following graphs by using the h slider. For each function, sketch its graph and mark where it has a vertical asymptote. State the domain and range for each function. Be able to explain why each graph has its vertical asymptote where it is in a whole class discussion after you finish the work sheet.

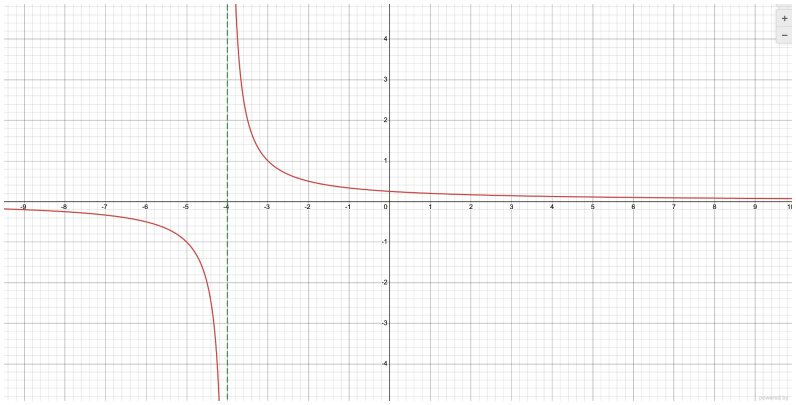
a) $y = 1/(x + 2)$ *Note that this is the same as writing the function as y = 1/(x - -2).*

Domain: $(-\infty, -2) \cup (-2, \infty)$ or All reals except $x = -2$
Range: $(-\infty, 0) \cup (0, \infty)$ or All reals except $y = 0$
Vertical Asymptote: $x = -2$



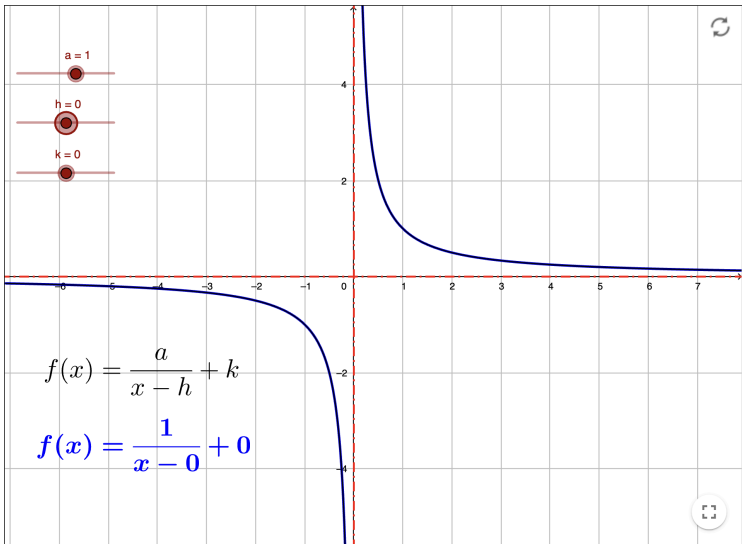
b) $y = 1/(x + 4)$

Domain: $(-\infty, -4) \cup (-4, \infty)$ or All reals except $x = -4$
Range: $(-\infty, 0) \cup (0, \infty)$ or All reals except $y = 0$
Vertical Asymptote: $x = -4$



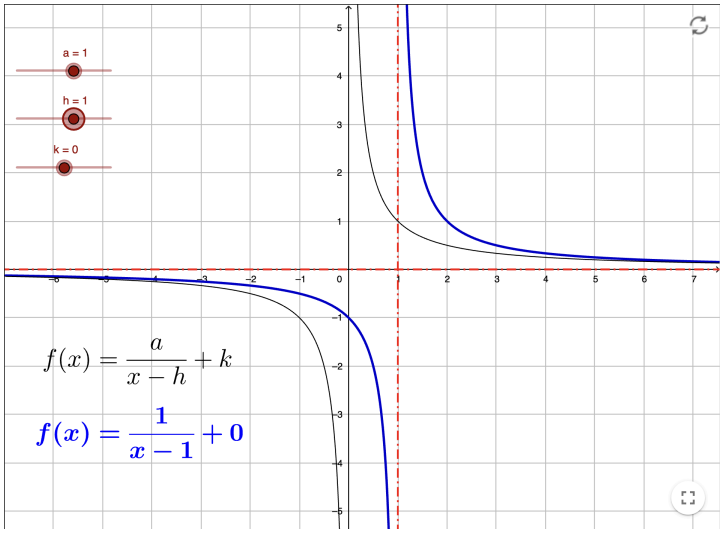
c) y = 1/x

Domain: (-∞, 0) ∪ (0, ∞) or All reals except x = 0
Range: (-∞, 0) ∪ (0, ∞) or All reals except y = 0
Vertical Asymptote: x = 0



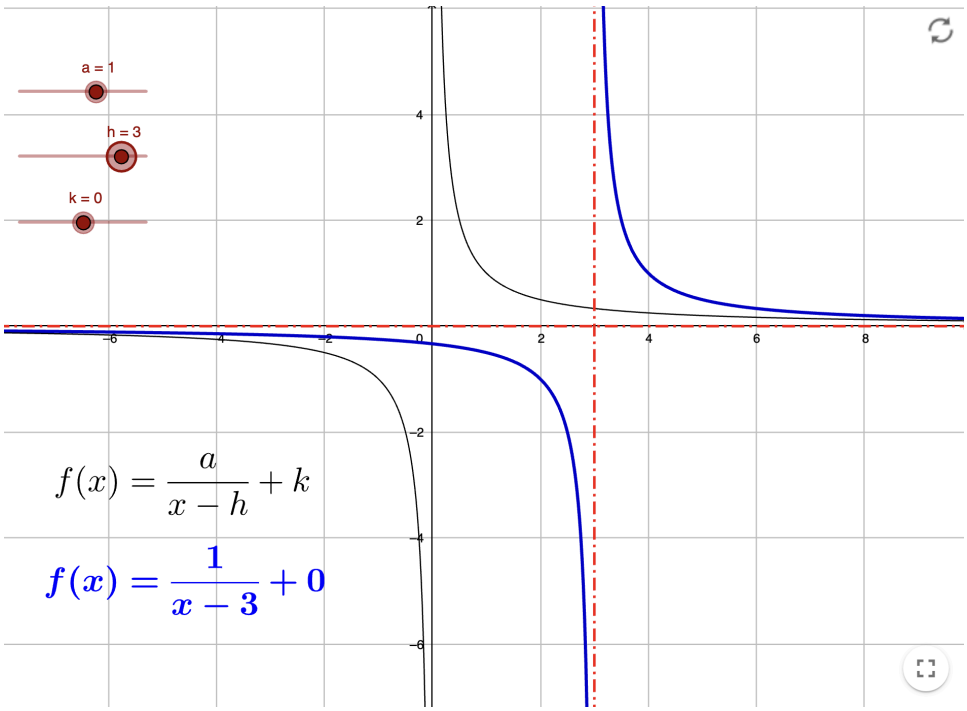
d) y = 1/(x - 1)

Domain: (-∞, 1) ∪ (1, ∞) or All reals except x = 1
Range: (-∞, 0) ∪ (0, ∞) or All reals except y = 0
Vertical Asymptote: x = 0



e) y = 1/(x - 3)

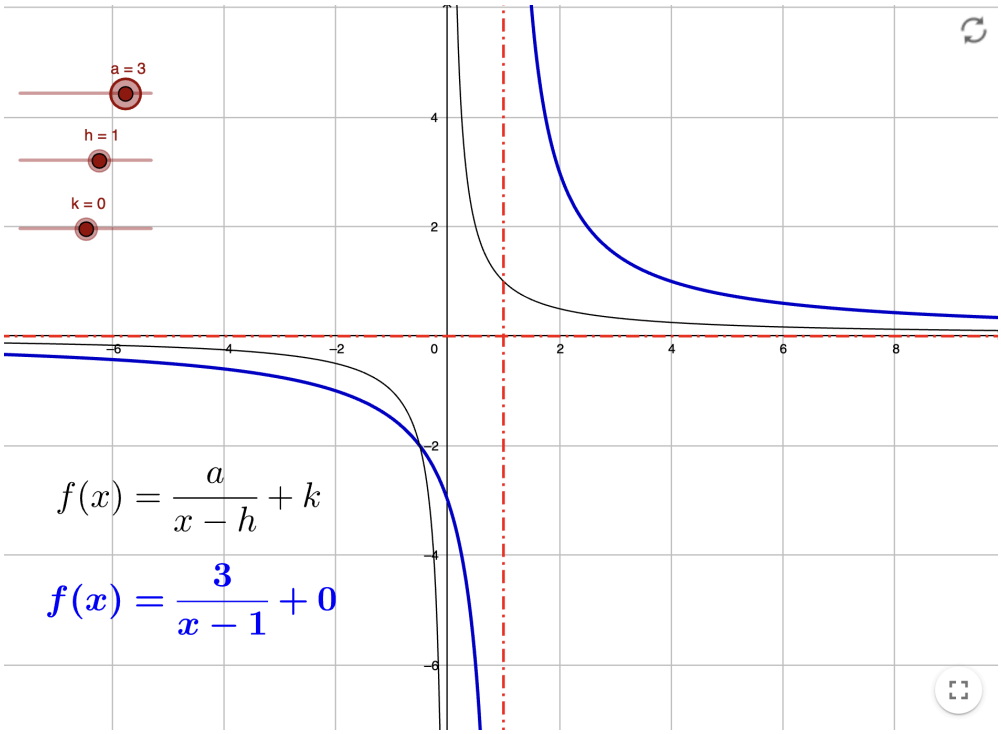
Domain: (-∞, 3) ∪ (3, ∞) or All reals except x = 3
Range: (-∞, 0) ∪ (0, ∞) or All reals except y = 0
Vertical Asymptote: x = 3



2. Now use the same GeoGebra applet: https://www.geogebra.org/m/Fsnt4mRk to create the following graphs by using both the a and h sliders. For each function, sketch its graph and mark where it has a vertical asymptote.

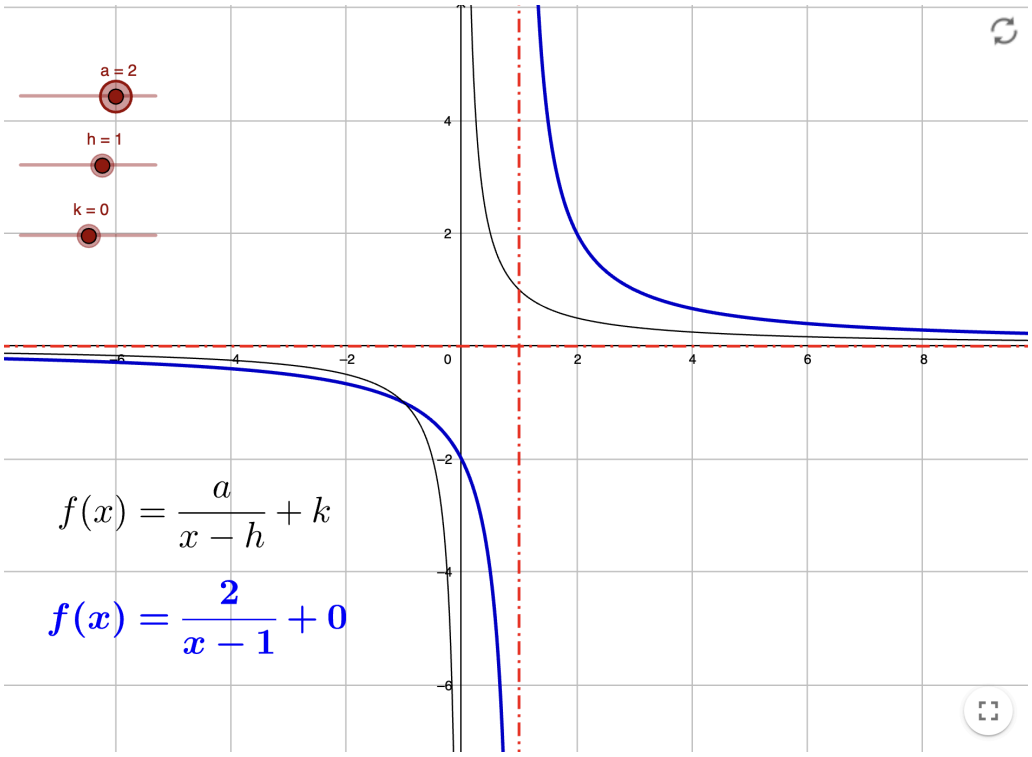
a) $y = 3/(x - 1)$

Domain: $(-\infty, 1) \cup (1, \infty)$ or All reals except $x = 1$
Range: $(-\infty, 0) \cup (0, \infty)$ or All reals except $y = 0$
Vertical Asymptote: $x = 1$



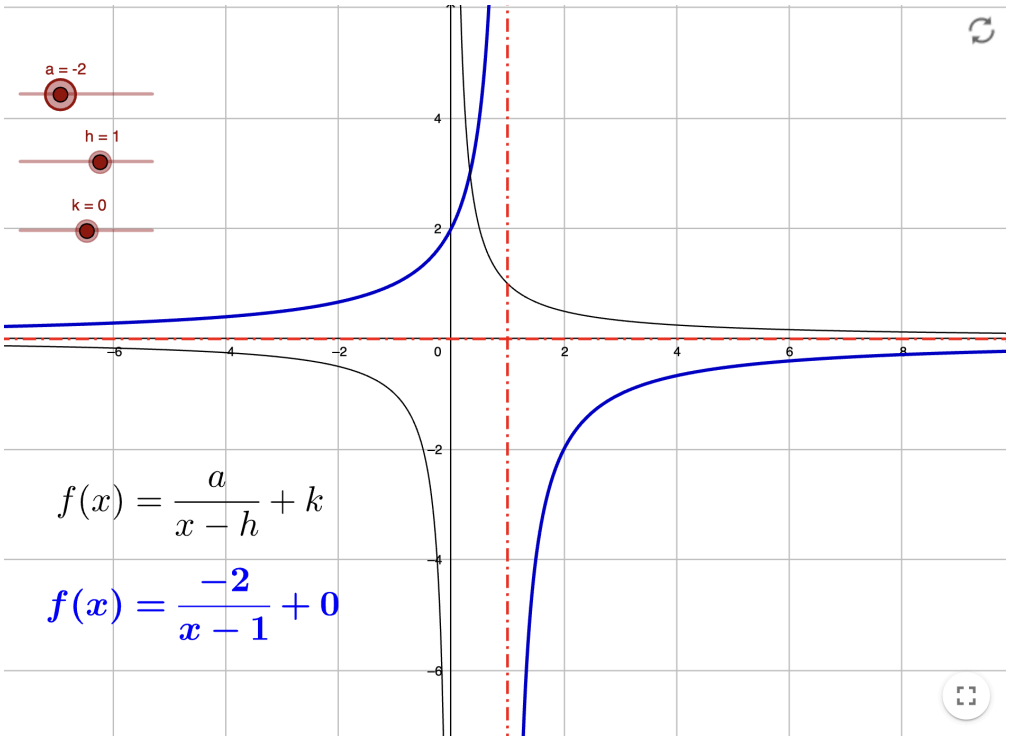
b) $y = 2/(x - 1)$

Domain: $(-\infty, 1) \cup (1, \infty)$ or All reals except $x = 1$
Range: $(-\infty, 0) \cup (0, \infty)$ or All reals except $y = 0$
Vertical Asymptote: $x = 1$



c) $y = -2/(x - 1)$

Domain: $(-\infty, 1) \cup (1, \infty)$ or All reals except $x = 1$
Range: $(-\infty, 0) \cup (0, \infty)$ or All reals except $y = 0$
Vertical Asymptote: $x = 1$



d) What do you think the graph of $y = a/(x - h)$ would look like, if a and h are constants and

i) $a > 0$? Various responses about the shape of the graph, its concavity, or its asymptotes are possible.

ii) $a < 0$? Various responses about the shape of the graph, its concavity, or its asymptotes are possible.