MHF p 166 #11 (HW) (Section 3.2)

Each function described below is the riciprocal of a quadratic function. Write an equation to represent each function.

(a) The horizontal asymptote is $y=0$. The vertical asymptotes are $x=2$ and $x=-3$. The intervals $x<-3$ and $x>2$ have $y>0$.

Example: $y=\frac{1}{(x-2)(x+3)}$

The horizontal asymptote, which is about the behaviour in the long run, is $y=0$

That means as $x \to \pm\infty$, the denominator "approaches" $+\infty$, so $f(x) \to 0^+$

[Inded as $\underbrace{x \to -\infty}_{x<-3}$, $y>0$; as $\underbrace{x \to +\infty}_{x>2}$, $y>0$]

Answers may vary and variance has to do with a constant multiplier; e.g.

$y=\frac{5}{(x-2)(x+3)}$

(b) The horizontal asymptote is $y=0$. There is no vertical asymptote. The max point is $(0, 0.5)$

Domain: $\{x \mid x \in \mathbb{R}\}$

$y=\frac{1}{f(x)}$ ← reciprocal function with HA: $y=0$

No vertical asymptote means the denominator, $f(x)$ has no real roots. So $f(x)$ has no real x-intercepts.

For the reciprocal to have a maximum, the original function, $f(x)$, has to have a min. value of $\frac{1}{0.5}=2$.

$\therefore\ y=\frac{1}{x^2+2}$. The max point $(0, 0.5)$ corresponds to the vertex of "original" fun-n $f(x)$ which is $(0, 2)$

(c) The horizontal asymptote is $y=0$
The vertical asymptote is $x=-3$.
Domain: $\{x \in \mathbb{R}, x \neq -3\}$
Since HA: $y=0$ is present, as $x \to \pm\infty$,
$y \to 0$.
Using information about asymptotes

$$y = \frac{1}{(x+3)^2} \quad \text{or} \quad y = -\frac{1}{(x+3)^2}$$

or multiples of those.