① Domain: $D=\{x \mid x\in\mathbb{R}\}$

fun-n $y=f(x)$
is continuous on $\mathbb{R}$

$N(x)=(x-2)(x-5)$
$D(x)=x^2+2$
has no real roots.
→ no discontinuities.

② Range: not obvious.

③ Intercepts:

(a) x-int: $y=0$
$(x-2)(x-5)=0$
$x-2=0$ or $x-5=0$
$x=2$ or $x=5$

(b) y-int: $x=0$, $y=\frac{(-2)(-5)}{2}=5$

④ Symmetry: $D(x)$ is even, the numerator tells the tale. $N(x)=(x-2)(x-5)=x^2-7x+10$ is neither.

∴ $f(x)$ is neither.

⑤ Asymptotes: VA: none!

HA: $y=\frac{1x^2-7x+10}{1x^2+2} \rightarrow y=\frac{1}{1} \rightarrow \boxed{y=1}$

$$y=\frac{1-\overset{\to 0}{\cancel{\frac{7}{x}}}+\overset{\to 0}{\cancel{\frac{10}{x^2}}}}{1+\underset{\to 0}{\cancel{\frac{2}{x^2}}}}$$

As $x\to\pm\infty$, $y\to\frac{1-0+0}{1+0}=1$

⑥ As $x\to+\infty$, $y\to 1$
As $x\to-\infty$, $y\to 1$

⑦ Crossover: Set $y=1$, $1=\frac{x^2-7x+10}{x^2+2}$

$\cancel{x^2}-7x+10=\cancel{x^2}+2$, $-7x=-8$, $\xrightarrow{\qquad} x=\frac{8}{7}=1\frac{1}{7}$

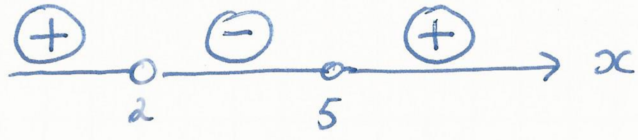
There is (only) one point of crossover. $1<\frac{8}{7}<2$.

⑧ Intervals of Constant Sign
(Positive Y-value vs Negative Y-value)

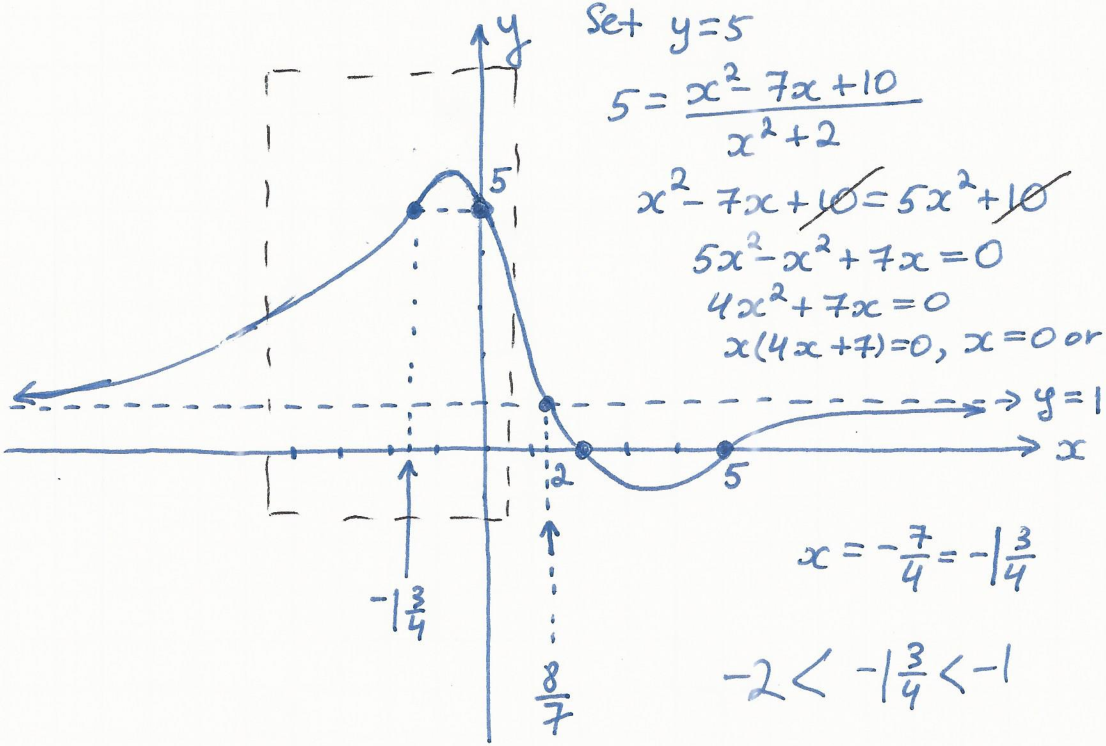
$y=\frac{(x-2)(x-5)}{x^2+2}$

$x^2\geq 0$ (non-negative)
$x^2+2\geq 2>0$

$N(x)=(x-2)^1(x-5)^1$



$f(x)<0$
$\underbrace{\text{when } 2<x<5}_{\text{graph below the } x\text{-axis}}$



Set $y=5$

$$5=\frac{x^2-7x+10}{x^2+2}$$

$$x^2-7x+\cancel{10}=5x^2+\cancel{10}$$

$$5x^2-x^2+7x=0$$

$$4x^2+7x=0$$

$x(4x+7)=0$, $x=0$ or $x=-\frac{7}{4}$

$$x=-\frac{7}{4}=-1\frac{3}{4}$$

$$-2<-1\frac{3}{4}<-1$$