1. Sketch the rational function by graphing the horizontal asymptote, vertical asymptote, and zeros of
$$f(x) = \frac{x-3}{x+5}.$$

① horizontal asymptote:

f asymptotically equal to

$$\frac{\text{leading term of numerator}}{\text{leading term of denominator}} = \frac{x}{x} = 1$$

So $y=1$ is horizontal asymptote.

f crosses at horizontal asymptote if:

$$f(x)=1$$
$$\frac{x-3}{x+5}=1$$
$$x-3=x+5$$
$$-3=5 \quad \text{no solution}$$

So never crosses.

② zeros:

The zeros of f are zeros of numerator:

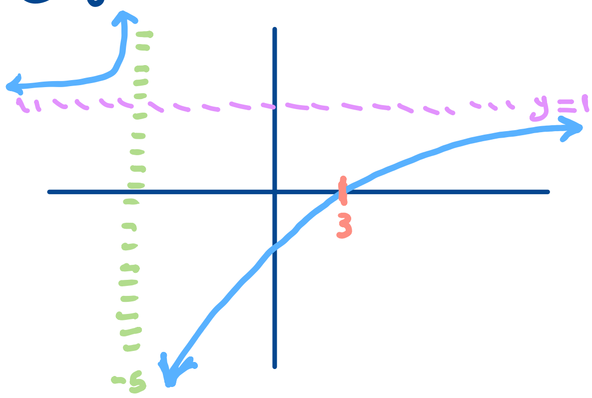
$x=3$

③ vertical asymptote:

Poles of f are vertical asymptote:

$x=-5$

④ graph of f:



2. Sketch the rational function by graphing the horizontal asymptote, vertical asymptote, and zeros of
$$f(x) = \frac{x-1}{x^2-16}.$$

① horizontal asymptote:

f asymptotically behaviors like

$$\frac{x}{x^2} = \frac{1}{x}$$

So f has horizontal asymptote $y=0$.

f crosses when

$$f(x)=0$$
$$\frac{x-1}{x^2-16}=0$$
$$\Rightarrow x-1=0$$
$$\Rightarrow x=1 \quad \text{only place they cross}$$

② zeros:

The zeros of f are zeros of numerators

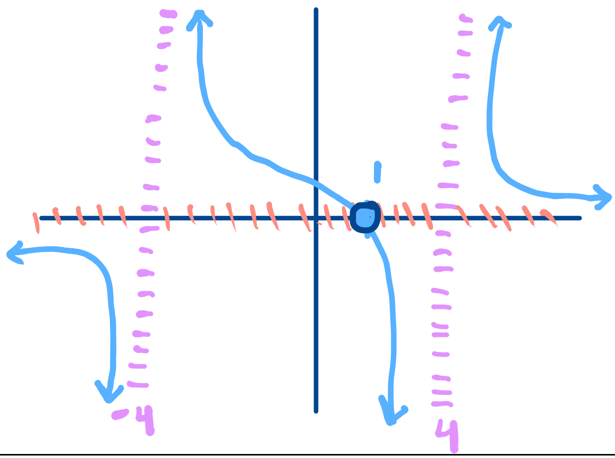
$x=1$

③ Vertical asymptote:

Poles of f are vertical asymptote:

$$x^2-16=0$$
$$(x-4)(x+4)=0$$
$$x=4 \quad \text{or} \quad x=-4$$

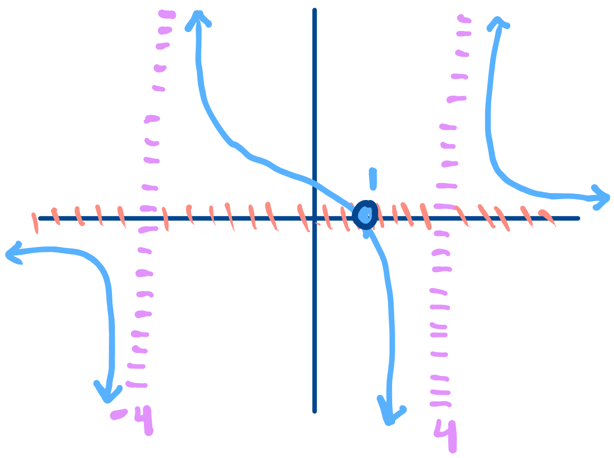
④ Graph



3. Solve the following inequality:

$$\frac{x-1}{x^2-16} \geq 0.$$

Use graph. Find all x where function is zero or positive.

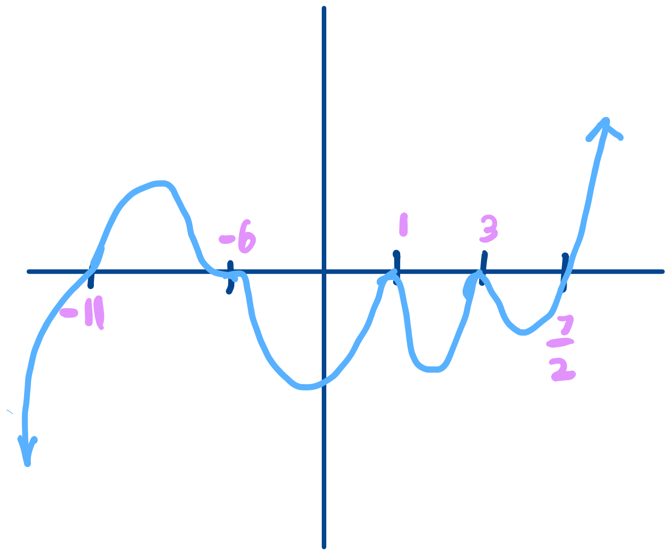


$(-4, 1] \cup (4, \infty)$

4. Solve the following inequality:

$$20(x+11)^5(x+6)^3(x-1)^2(x-3)^4(2x-7)^5 < 0.$$

Use graph. Find all x so that f is negative



$(-\infty, -11) \cup (-6, 1) \cup (1, 3) \cup (3, \frac{7}{2})$