Reminder: Sometimes a value of x that seems to be a vertical asymptote is actually a hole

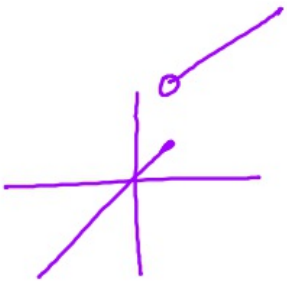
Find all horizontal and vertical asymptotes

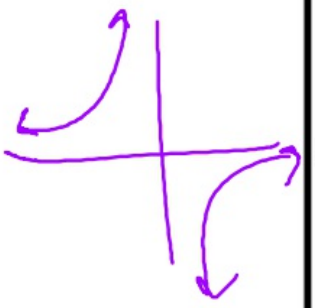
A) $f(x)=\frac{x+1}{x}$

B) ~~$f(x)=2^x$~~

C) $f(x)=\frac{-3x^2+1}{x^2-1}$

D) $f(x)=\frac{3x-9}{x^2-9}$





E) $f(x)=\frac{3x^3+3}{x^2+1}$

V.A. None

H.A. None

F) $f(x)=\frac{x+5}{x^3-27}$

V.A. $x=3$

H.A. $y=0$

Infinite → V.A.
Removable → Hole

Determine if each function is continuous. If the function is not continuous, find the x-axis location of each discontinuity and classify each discontinuity as infinite or removable. Also find any horizontal asymptotes.

$3x(x+5)$

A) $f(x)=\frac{3x^2+15x}{x+5}$

Not continuous

P.O.D $x=-5$

Hole $x=-5$

H.A. None

B) $f(x)=\frac{x^2+3x}{x+2}$

Not Continious

P.O.D $x=-2$

V.A. $x=-2$

H.A. None

$x^2-4=0$

$(x-2)(x+2)=0$

C) $f(x)=\frac{9x+6}{x^2-4}$

Not Continuous

P.O.D $x=\pm 2$

V.A. $x=\pm 2$

H.A. $y=0$

D) $f(x)=\frac{9x+18}{x^2-4}$

Not Continuous

P.O.D. $x=\pm 2$

V.A. $x=2$

Hole $x=-2$

H.A. $y=0$

$x^2-4x-5=0$

$(x-5)(x+1)$

E) $f(x)=\frac{x-5}{x^2-4x-5}$

Not Continuous

P.O.D $x=5,-1$

Hole $x=5$

V.A. $x=-1$

H.A. $y=0$

Identify each point of discontinuity, holes, vertical asymptote, horizontal asymptote, zero(s), y-intercept, domain, and range.

$-4x-16=0$
$-4x=16$
$x=-4$

1st →

$f(x)=\frac{x-4}{-4x-16}$ $x-4=0$ $x=4$

Zeros: (x-intercepts) $x=4$

y-intercepts: $(0,\frac{1}{4})$

Points of Discontinuity: $x=-4$

Hole: None

Vertical Asymptote: $x=-4$

Horizontal Asymptote: $y=-\frac{1}{4}$

Domain: $(-\infty,-4)\cup(-4,\infty)$

Range: $(-\infty,-\frac{1}{4})\cup(-\frac{1}{4},\infty)$

$f(x)=\frac{4}{x^2-3x}$ $x^2-3x=0$ $x(x-3)$

Zeros: None

y-intercepts: None

Points of Discontinuity: $x=0,3$

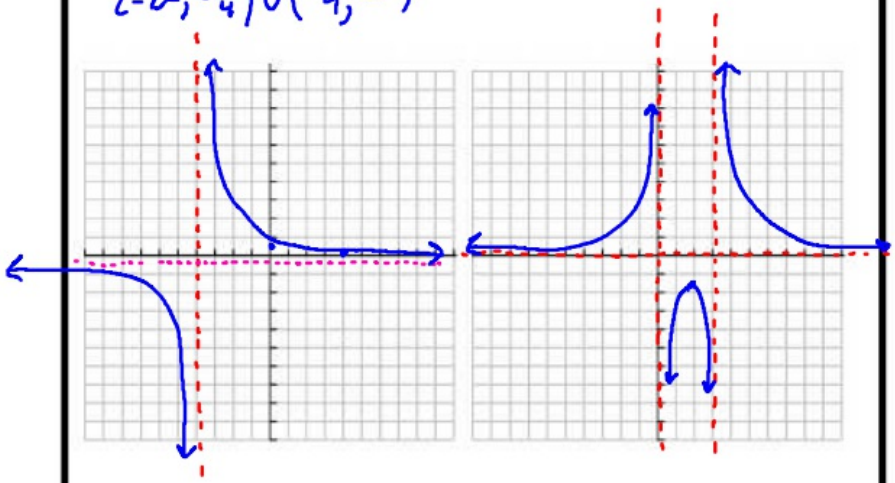
Hole: None

Vertical Asymptote: $x=0,3$

Horizontal Asymptote: $y=0$

Domain: $(-\infty,0)\cup(0,3)\cup(3,\infty)$

Range: $(-\infty,-2]\cup(0,\infty)$



$x^2-2x-3=0$

$(x-3)(x+1)$

$x=3, -1$

$x^3-9x=0$

$x(x^2-9)=0$

$x(x+3)(x-3)$

$x=0 \quad x=-3 \quad \cancel{x=3}$

$f(x)=\frac{x^3-9x}{3x^2-6x-9}$

Zeros: $x=0, -3$

y-intercepts: $(0,0)$

Points of Discontinuity: $x=3, -1$

Hole: $x=3$

Vertical Asymptote: $x=-1$

Horizontal Asymptote: None

Domain: $(-\infty,-1)\cup(-1,3)\cup(3,\infty)$

Range: $(-\infty,\infty)$

$f(x)=\frac{3x^2-12x}{x^2-2x-3}$

Zeros:

y-intercepts:

Points of Discontinuity:

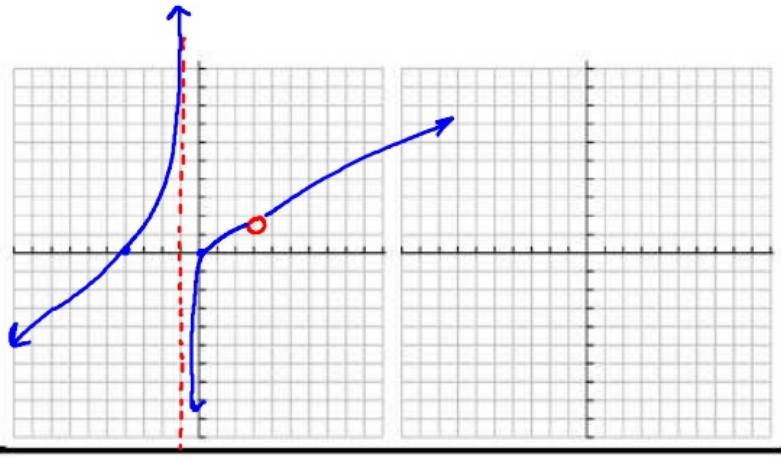
Hole:

Vertical Asymptote:

Horizontal Asymptote:

Domain:

Range:



$\frac{x(x-3)(x+3)}{3(x-3)(x+1)}$

$\frac{x(x+3)}{3(x+1)}$

$\frac{3(3+3)}{3(3+1)}=\frac{18}{12}$