Determine the range of the function

A) $f(x)=4+x^2$

B) $f(x)=2+\sqrt{9-x}$

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

H.A. $y=-1$

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

H.A. $y=-2$

Point of Discon.

Removable (Hole)

x-value makes top and Bottom Zero.

P.O.D = x-intercept

Infinite (Vertical Asymptote)

x-value only makes Bottom Zero.

Graph the function and tell whether or not the function has a point of discontinuity at x = 0. If there is a discontinuity, tell whether the discontinuity is removable (Hole) or non-removeable (Vertical Asymptote).

Infinite

$\frac{x^2+x}{x}$

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

$\frac{0^2+0}{0}=\frac{0}{0}$

A) $f(x)=\frac{5}{x}$

Yes P.O.D @ $x=0$

Vertical Asymptote

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

Yes P.O.D @ $x=0$

Hole

C) $f(x)=\frac{|5x|}{x}$

Yes P.O.D @ $x=0$

Hole

D) $f(x)=\frac{2x}{x-4}$

$x=0$ Not P.O.D.

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

Horizontal Asymptotes

If Degree on top is bigger
No H.A.

If Degree on Bottom is bigger
H.A. $y=0$

If Degrees are equal
H.A. $y=\frac{\text{Leading Coefficient}}{\text{Leading Coefficient}}$

Find all horizontal and vertical asymptotes

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

P.O.D
$x=0$
V.A.
H.A. $y=\frac{1}{1}$
$y=1$

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

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

$x^2-1=0$
$(x-1)(x+1)=0$
$x=\pm 1$
V.A. $x=\pm 1$
H.A. $y=\frac{-3}{1}$
$y=-3$

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

$x^2-9=0$
$(x-3)(x+3)=0$
$x=3$ $x=-3$
Hole V.A.
H.A $y=0$

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

No P.O.D.
H.A. None

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

$x^3-27=0$
$\sqrt[3]{x^3}=\sqrt[3]{27}$
$x=3$
P.O.D
$x=3$
V.A.
H.A $y=0$