What you will learn about:
Graphing Rational Functions

x-intercept
Let $y=0$ solve for x

y-intercept
Let $x=0$ solve for y

$0 = x^2 - 36$
$x^2 = 36$
$x = \pm 6$

Find the x-intercept(s) and y-intercept of each function.

A) $f(x) = x^2 - 36$

x-intercept
$0 = x^2 - 36$
$0 = (x-6)(x+6)$
$x-6=0 \quad x+6=0$
$x=6 \quad x=-6$

y-intercept
$y = 0^2 - 36$
$(0, -36)$

B) $f(x) = \frac{x-5}{x+3}$

x-intercept
$x-5=0$
$x=5$

y-intercept
$y = \frac{0-5}{0+3} = -\frac{5}{3}$

C) $f(x) = \frac{x}{x+6}$

x-intercept
$x=0$

y-intercept
$y = \frac{0}{0+6} = \frac{0}{6}$
$=0$

D) $\frac{x^2+4}{x+2}$

$x^2+4=0$
$x = \pm 2i$

x-intercept
$x^2+4=0$
None

y-intercept
$y = \frac{0^2+4}{0+2} = \frac{4}{2}$
$=2$

E) $f(x) = \frac{x^2-3x-10}{x}$

$x^2-3x-10=0$
$(x-5)(x+2)=0$
$x-5=0 \quad x+2=0$
$x=5 \quad x=-2$

$\frac{0^2-3(0)-10}{0} = \cancel{\frac{-10}{0}}$

None

Domain
X-values (Input)

- Undefined values make Bottom of Faction Zero
- Undefined values can not be in Domain

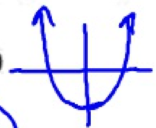
$x^2+2x-3=0$

$(x-1)(x+3)=0$

$x=1 \quad x=-3$

Find the domain of the function algebraically. Support your answer graphically

A) $f(x)=x^2-9$



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

B) $f(x)=\frac{1}{x+5}$

$x+5=0$

$x=-5$

D: $(-\infty,-5)\cup(-5,\infty)$

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

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

D) $f(x)=\frac{3}{x}+\frac{7}{x-1}$

$x=0$

$x=1$

D $(-\infty,0)\cup(0,1)\cup(1,\infty)$

E) $f(x)=\frac{x+6}{x^2-36}=\frac{x+6}{(x-6)(x+6)}$

$x=6, \; x=-6$

D: $(-\infty,-6)\cup(-6,6)\cup(6,\infty)$

Range y-values (output) Look at graph	Determine the range of the function A) $f(x)=4+x^2$ $R: [4,\infty)$ B) $f(x)=2+\sqrt{9-x}$ $R: [2,\infty)$ C) $f(x)=\frac{x^2}{4-x^2}$ $R: (-\infty,-1) \cup [0,\infty)$ D) $f(x)=\frac{3-2x^2}{4+x^2}$ $\quad \frac{3-0}{4+0}=\frac{3}{4}$ $R: (-2, \frac{3}{4}]$
Point of Discontinuity undefined value • Vertical Asymptote Value that make only bottom zero • Hole Value make top and 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). A) $f(x)=\frac{5}{x}$ $f(0)=\frac{5}{0}$ Yes $x=0$ Point of Discontinuity Vertical Asymptote B) $f(x)=\frac{x^2+x}{x}$ $\quad \frac{\cancel{x}(x+1)}{\cancel{x}}$ $f(0)=\frac{0^2+0}{0}$ $x=0$ is a Point of Discontinuity Hole C) $f(x)=\frac{\lvert 5x\rvert}{x}$ Yes $x=0$ P.O.D 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	Find all horizontal and vertical asymptotes
Horizontal Asymptote • Degree on top is greater than degree on Bottom No H.A. • If Degree on Bottom is greater than Degree on top H.A. $y=0$ • If Degrees are equal then HA is Ratio of Leading Coefficients $y = \frac{LC}{LC}$	A) $f(x)=\frac{1x+1}{1x}$ V.A. $x=0$ H.A. $y=\frac{1}{1}=1$ B) ~~$f(x)=2^x$~~ C) $f(x)=\frac{-3x^2+1}{x^2-1}$ $x^2-1=0$ $(x-1)(x+1)=0$ $x=1 \quad x=-1$ V.A. $x=1, x=-1$ H.A. $y=\frac{-3}{1}=-3$ D) $f(x)=\frac{3x-9}{x^2-9}$ P.O.D $= x=\cancel{3},-3$ V.A. $x=-3$ H.A. $y=0$ E) $f(x)=\frac{3x^3+3}{x^2+1}$ F) $f(x)=\frac{x+5}{x^3-27}$