

1. Identify any vertical, and/or horizontal asymptote of each function.

a.  $y = \frac{2x+2}{3x+1}$

V.A.  $3x+1=0$   
 $3x=-1$   
 $x=-\frac{1}{3}$   
 $x=-\frac{1}{3}$

H.A.  $y=\frac{2}{3}$

b.  $y = \frac{2x^2-x+4}{x-1}$

V.A.  $x-1=0$   
 $x=1$

H.A. None

2. Identify points of discontinuity and horizontal of each function. Then determine if the points of discontinuity are vertical asymptotes or if they are holes in the graph. Show your work.

a.  $y = \frac{3x-9}{x-3} = \frac{3(x-3)}{x-3}$

Point of Discontinuity  
 $x=3$

$x=3$  Hole

H.A.  $y=3$

b.  $y = \frac{x+4}{x^2-16} = \frac{x+4}{(x+4)(x-4)}$

Discontinuity  
 $x=4, -4$

Hole  $x=-4$

V.A.  $x=4$

H.A.  $y=0$

→ Asymptotes

3. Give everything about the following functions (*Hint: zeroes, asymptotes, intercepts, holes, domain*) and sketch a graph. **Make sure you graph all important information. Make sure to label your axis.**

I.  $y = \frac{x+2}{x^2-4}$

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

Points of Discontinuity  
 $x = \pm 2$

V.A.:  $x = 2$

H.A.:  $y = 0$

Zeroes: None

Holes:  $x = -2$

y-intercept:  $(0, -\frac{1}{2})$

Domain:

$(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

II.  $f(x) = \frac{3x-4}{x+2}$

Point of Discontinuity  
 $x = -2$

$3x-4=0$   
 $3x=4$   $x = \frac{4}{3}$

V.A.  $x = -2$

H.A.  $y = 3$

Zeros  $x = \frac{4}{3}$

Holes None

y-intercept  $-2$   
 $(0, -2)$

Domain

$(-\infty, -2) \cup (-2, \infty)$

III.  $g(x) = \frac{x^2-49}{x^2-16} = \frac{(x-7)(x+7)}{(x-4)(x+4)}$

Points of Discontinuity  
 $x = 4, -4$

V.A.  $x = 4, -4$

H.A.  $y = 1$

Zeros  $x = 7, -7$

Holes None

y-intercept  $(0, \frac{49}{16})$

Domain

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

