Identify the points of discontinuity, holes, vertical asymptotes, x-intercepts, and horizontal asymptote of each.

1) $f(x)=\dfrac{1}{3x^2+3x-18}$

$3(x^2+x-6)$

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

No holes

VA: $x=4$

HA: $y=1$

3) $f(x)=\dfrac{x^3-x^2-6x}{-3x^2-3x+18}$

HA: top slant

4) $f(x)=\dfrac{x^2+x-6}{-4x^2-16x-12}$

Holes: None } Restrictions

$\dfrac{x(x^2-x-6)}{-3(x^2+x-6)}$ $\dfrac{x(x-3)(x+2)}{-3(x+3)(x-2)}$

VA:

$-3(x+3)(x-2)=0$

$\dfrac{-3(x+3)(x-2)}{-3}=\dfrac{0}{-3}$

$(x+3)(x-2)=0$

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

$x=-3$ $x=2$

4) $f(x) = \dfrac{x^2 + x - 6}{-4x^2 - 16x - 12}$

HA: look at degree

SAME $\dfrac{1x^2 \ldots}{-4x^2 \ldots}$ $y = \dfrac{-1}{4}$

$-1 \cdot 6 \quad 1 \cdot -6$

$-2 \cdot 3 \quad 2 \cdot -3$

Restrictions

$\dfrac{(x+3)(x-2)}{-4(x^2+4x+3)} = \dfrac{(x+3)(x-2)}{-4(x+3)(x+1)}$ cancel

$1 \cdot 3$

$-1 \cdot -3$

Holes: cancels

$\dfrac{(x-2)}{-4(x+1)} = \dfrac{-5}{8}$

$x+3=0$

$x=-3$

$\left(-3, \dfrac{-5}{8}\right)$

VA: $-4(x+1) = 0$

$\dfrac{-4}{-4}$ $\dfrac{}{-4}$

$x+1=0$

$x=-1$

1) $f(x) = \frac{1}{3x^2 + 3x - 18}$

HA: bottom $y=0$

$3(x^2+x-6)$

FACTORS

$3(x+3)(x-2)$

$-1 \cdot 6 \quad 1 \cdot -6$

$-2 \cdot 3 \quad 2 \cdot -3$

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

No holes → cancel out

$\frac{3(x+3)(x-2)}{3} = \frac{0}{3}$

VA: $3(x+3)(x-2) = 0$

$x+3=0 \quad x-2=0$

$x=-3 \quad x=2$

Restrictions

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5) $f(x) = -\dfrac{4}{x^2 - 3x}$

HA: bottom $y=0$

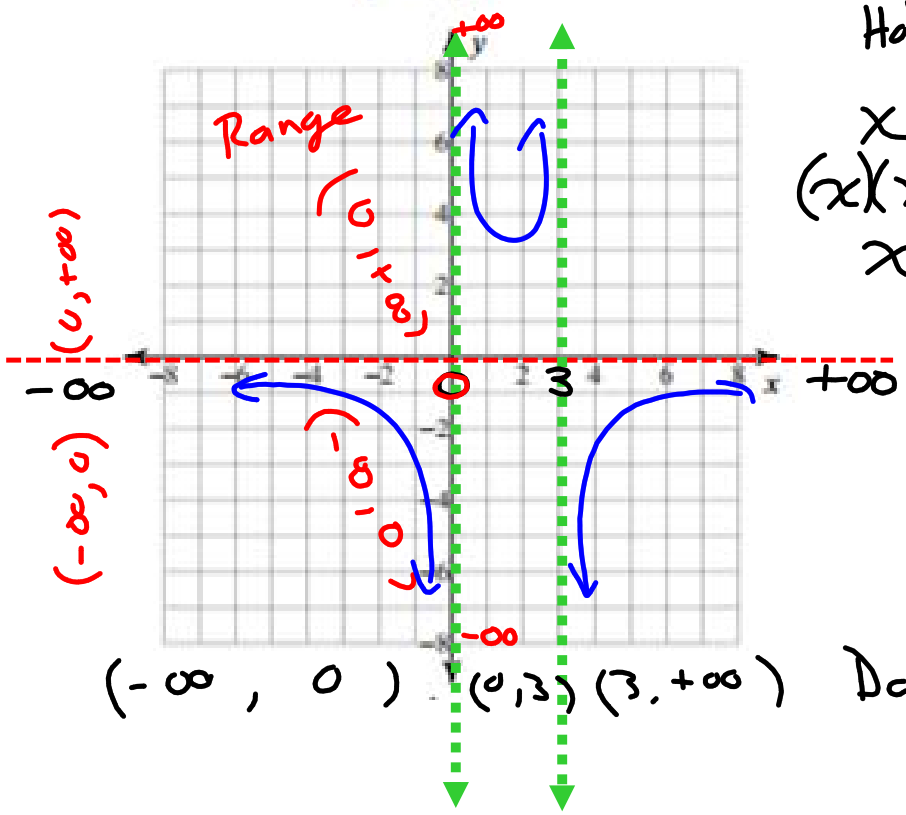
Holes & VA:

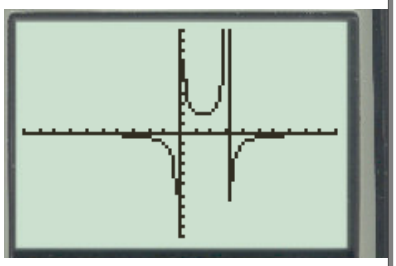
$x^2 - 3x = 0$

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

$x = 0 \quad x - 3 = 0$

$x = 3$





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

6) $f(x) = \dfrac{x-4}{-4x-16}$

HA: $y = -\frac{1}{4}$

Holes None

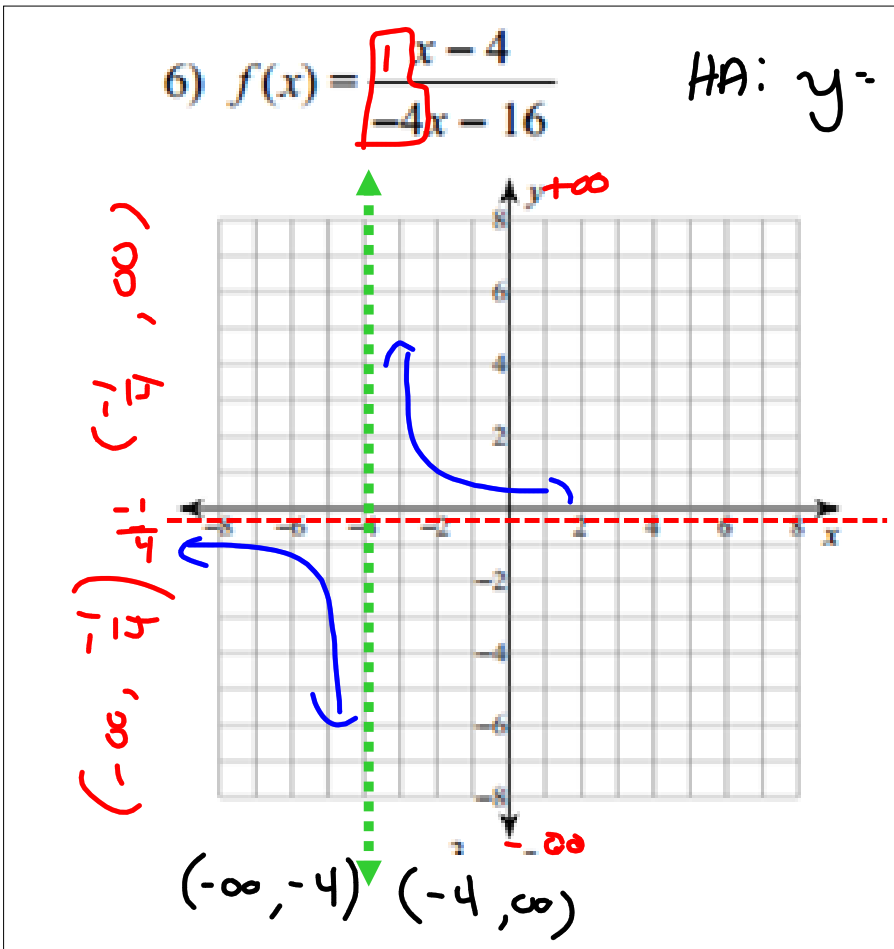
$\dfrac{(x-4)}{-4(x+4)}$

VA:

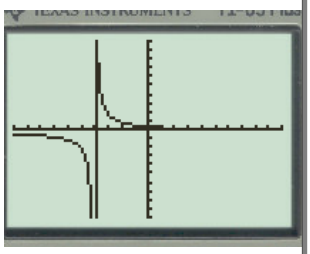
$-4(x+4)=0$

$(x+4)=0$

$x=-4$



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



7) $f(x) = \dfrac{x+4}{-2x-6}$

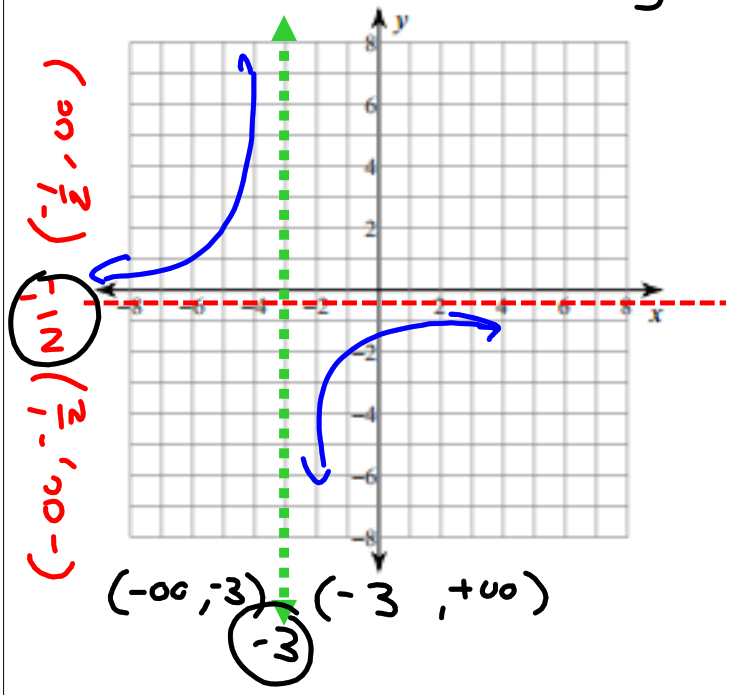
HA: degrees are the same
$y = -\frac{1}{2}$

Holes: None

$\dfrac{x+4}{-2(x+3)}$

VA: $-2(x+3) = 0$

$x = -3$



$(-\infty, -\frac{1}{2})$ $(-\frac{1}{2}, \infty)$

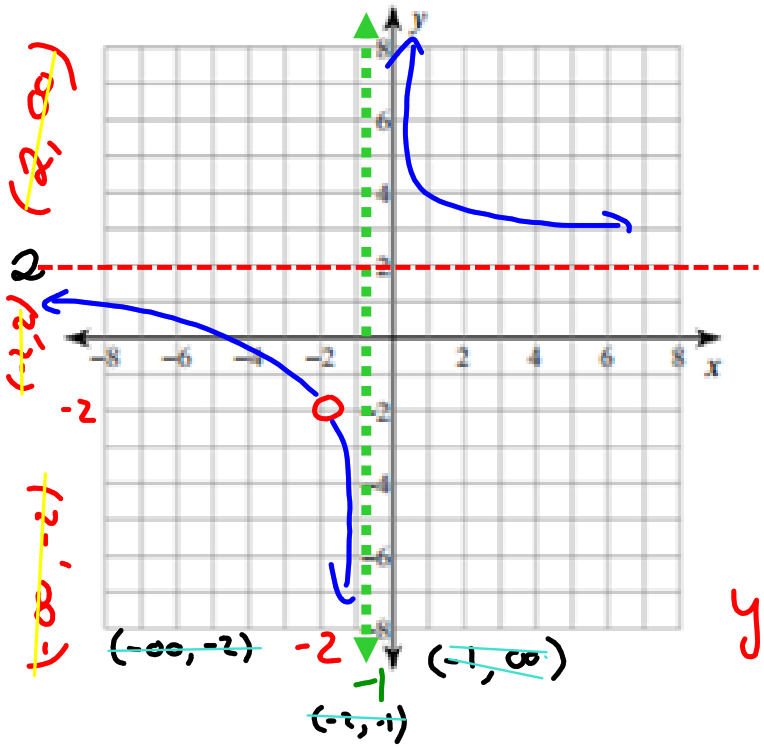
$-\frac{1}{2}$

$(-\infty, -3)$ $(-3, +\infty)$

-3

8) $f(x) = \dfrac{2x^2 + 10x + 12}{x^2 + 3x + 2}$

HA: $y = 2$



Holes:

$\dfrac{2(x^2 + 5x + 6)}{(x^2 + 3x + 2)}$ 1.6, $2^{2 \cdot 3}$, 1.2

$\dfrac{2(x+3)(x+2)}{(x+1)(x+2)}$

Hole @ $x + 2 = 0$

$x = -2$

$y = \dfrac{2(-2+3)}{(-2+1)} = \dfrac{2(1)}{-1} = -2$

$(-2, -2)$

VA: $(x+1) = 0$

$x = -1$