121 §3.6 I #s 5, 8, 14, 17, 20, 21, 24, 29
33, 42, 47, 52, 53, 56

#s 5-16 Find the domain of each rational function

(5) $f(x) = \frac{4}{x+2} \Rightarrow \mathcal{D} = \{x \mid x \neq -2\} =$

$= \boxed{(-\infty, -2) \cup (-2, \infty)}$

(8) $f(x) = \frac{2}{x^2 - x - 2} \Rightarrow \mathcal{D} = \{x \mid x^2 - x - 2 \neq 0\}$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$x \in \{-1, 2\}$

Ditch.

$= \{x \mid x \neq -1 \text{ and } x \neq 2\}$

$= \boxed{(-\infty, -1) \cup (-1, 2) \cup (2, \infty)}$

(14) $f(x) = \frac{x^2+1}{8x^3 - 2x} \Rightarrow \mathcal{D} = \{x \mid 8x^3 - 2x \neq 0\}$

$8x^3 - 2x = 0$

$2x(4x^2 - 1) = 0$

$2x(2x-1)(2x+1) = 0$

$x \in \{-\frac{1}{2}, 0, \frac{1}{2}\}$

Ditch

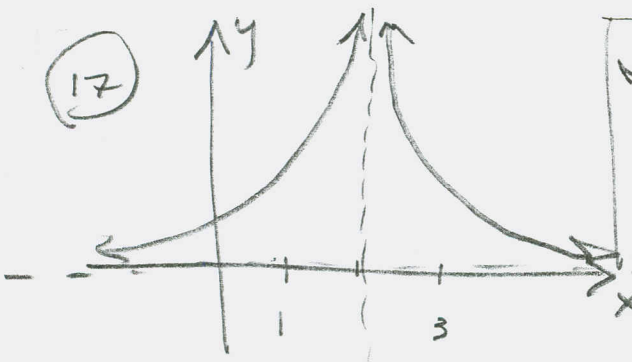
$= \{x \mid x \neq \pm\frac{1}{2} \text{ and } x \neq 0\}$

$= \boxed{(-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, 0) \cup (0, \infty)}$

#s 17-20 Determine the domain & eq'n of asymptotes for the graph of each rational function

121 §3.6 I #s 17, 20, 21, 24, 29, 33, 42, 47, 52, 53, 56

(17)



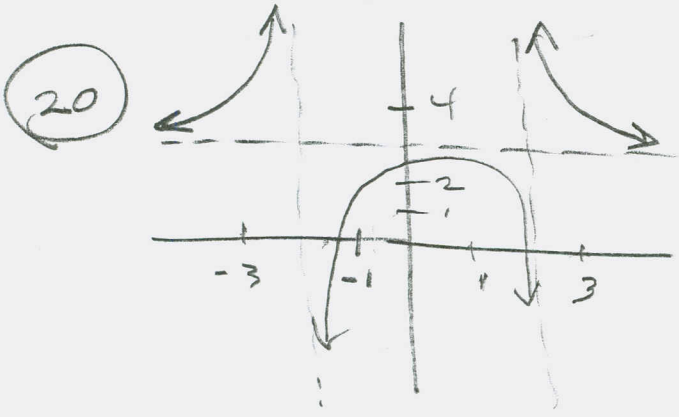
$\mathcal{D} = (-\infty, 2) \cup (2, \infty)$

H.A.: $y = 0$

V.A.: $x = 2$

$y = 0$

(20)



$\mathcal{D} = (-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

H.A. $y = 3$

V.A. $x = -2$, $x = 2$

#s 21-32 Determine the eq'ns of all asymptotes for the graph of each eq'n

(21) $f(x) = \dfrac{5}{x-2}$ H.A.: $y = 0$ (f is proper.)

V.A.: $x = 2$

(24) $f(x) = \dfrac{-2}{x^2-5x+6}$ H.A. $y = 0$ (f is proper.)

V.A. $x = 2$, $x = 3$

$x^2 - 5x + 6 = 0$

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

(29) $f(x) = \dfrac{3x^2+4}{x+1}$ ← deg = 2, ← deg = 1 ⟹ Oblique Asymptote

This says $\dfrac{3x^2+4}{x+1} = 3x - 3 + \dfrac{1}{x+1}$

$-1 \mid 3 \quad 0 \quad 4$

$\quad\quad -3 \quad 3$

$3 \quad -3 \quad 7$

O.A. $y = 3x - 3$

V.A. $x = -1$

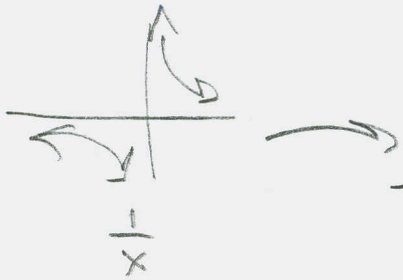
121 §3.6I #s 33, 42, 47, 52, 53, 56

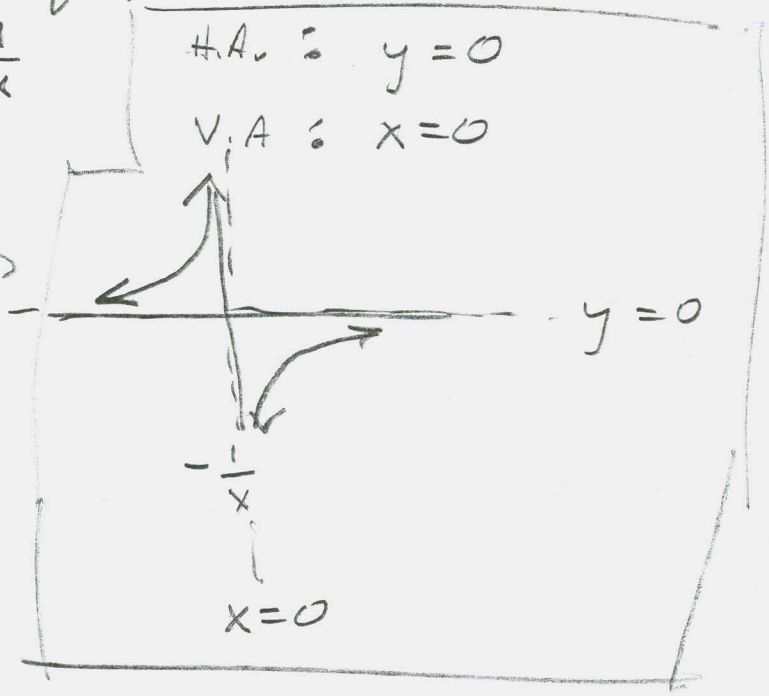
#s 33-52 Find all asymptotes, x-cpts, y-cpts, Sketch the graph

(33) $f(x) = -\frac{1}{x}$

H.A.: $y = 0$

V.A: $x = 0$





(42) $f(x) = \frac{x-3}{x+2}$ ← deg = 1 / deg = 1

$y = \frac{x}{x} = 1$

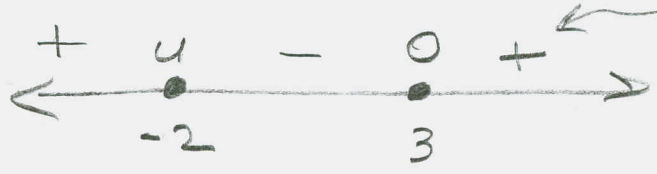
H.A.: $y = 1$ (>0)

V.A: $x = -2$

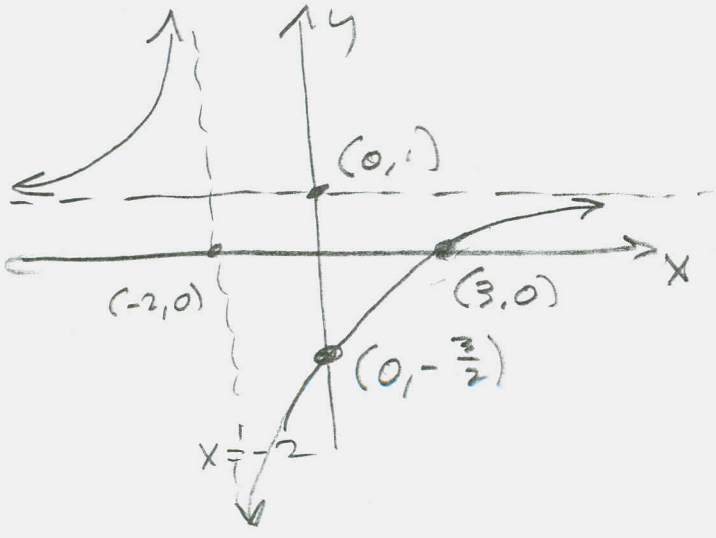
$f(x) = \frac{x-3}{x+2} = 0$

$\Rightarrow x - 3 = 0$

$\Rightarrow x = 3 \rightsquigarrow (3, 0)$



$f(0) = -\frac{3}{2} \rightsquigarrow (0, -\frac{3}{2})$



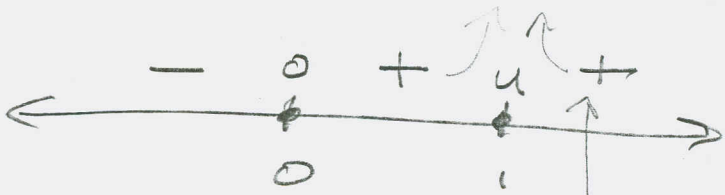
121 §3.6 #s 47, 52, 53, 56

(47) $f(x) = \dfrac{4x}{x^2-2x+1}$ | H.A.: $y = 0$ (proper)

$\dfrac{4x}{x^2-2x+1} = 0$

$4x = 0$

$x = 0 \rightsquigarrow (0,0)$ x- & y-int.



Test: $x = 2$

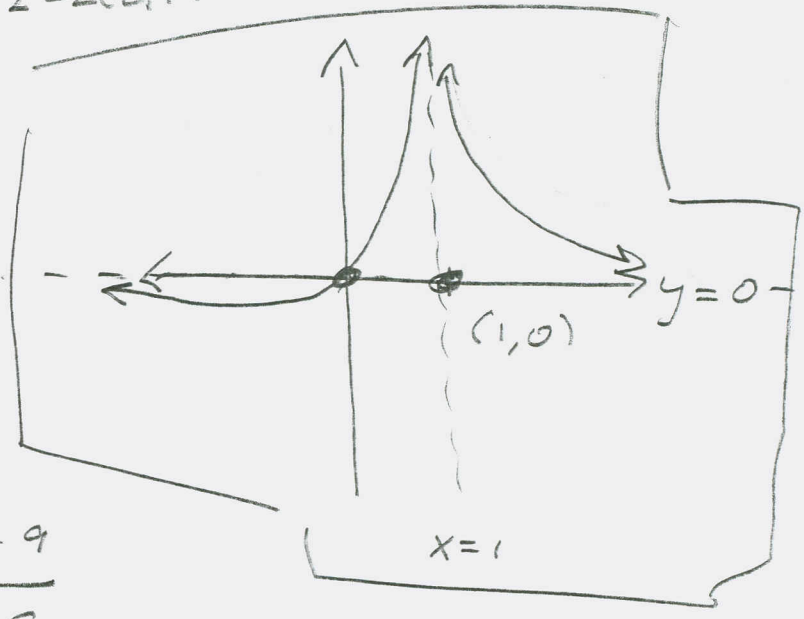
$\dfrac{4(2)}{2^2-2(2)+1} = \dfrac{8}{1} = 8 > 0$

$x^2-2x+1 = 0$

$(x-1)^2 = 0$

$x = 1$ DOES NOT CROSS x-axis, b/c $m = 2$

V.A.: $x = 1$



(52) $f(x) = \dfrac{-x^2+7x-9}{x^2-6x+9}$

$= \dfrac{-(x^2-7x+9)}{(x-3)^2}$

H.A.: $\dfrac{-x^2}{x^2} = -1 \rightsquigarrow$ $y = -1$; 3 H.A.

V.A.: $x = 3$ Does NOT CROSS, since $m = 2$

zeros: $x^2-7x+9 = 0$

$x^2 - 7x + \left(\frac{7}{2}\right)^2 = -9 + \frac{49}{4}$

$\left(x - \frac{7}{2}\right)^2 = \frac{-36+49}{4} = \frac{13}{4}$

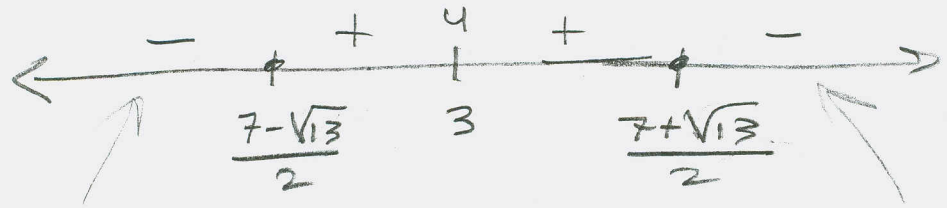
$x - \frac{7}{2} = \pm\frac{\sqrt{13}}{2}$

$x = \dfrac{7 \pm \sqrt{13}}{2}$

≈ 1.70 OR 5.30

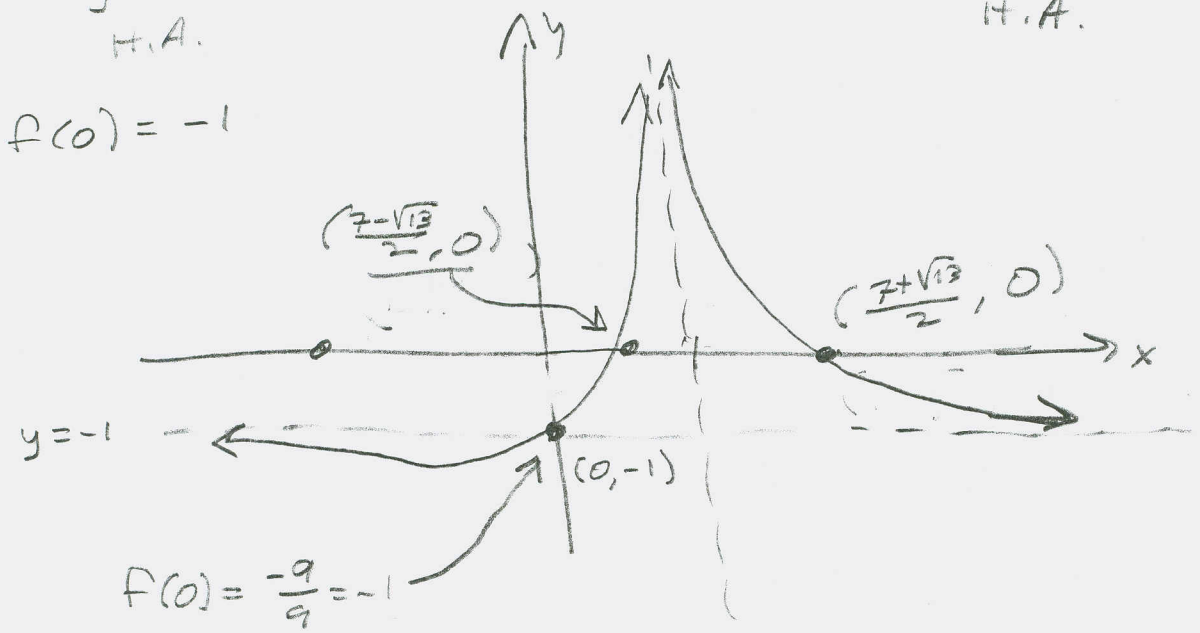
121 §3.6 I #s 52, 53, 56

(52) cont'd



$y=-1$ is H.A.

$y=-1$ is H.A.



(53) $\lim_{x\to\infty} \frac{1}{x^2}$ has H.A. $y=0$, so

$$\lim_{x\to\infty} \frac{1}{x^2} = 0$$

(56) $\lim_{x\to\infty} \frac{3x^2-1}{x^2-x}$ has H.A. $\frac{3x^2}{x^2} = 3$, so

$$\lim_{x\to\infty} \frac{3x^2-1}{x^2-x} = 3$$