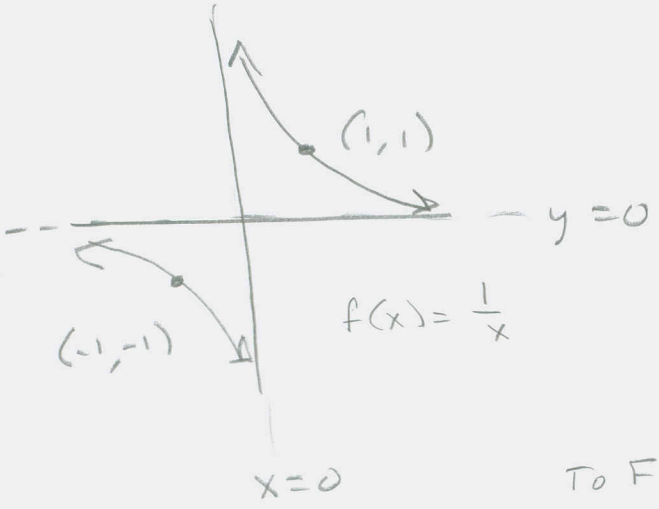
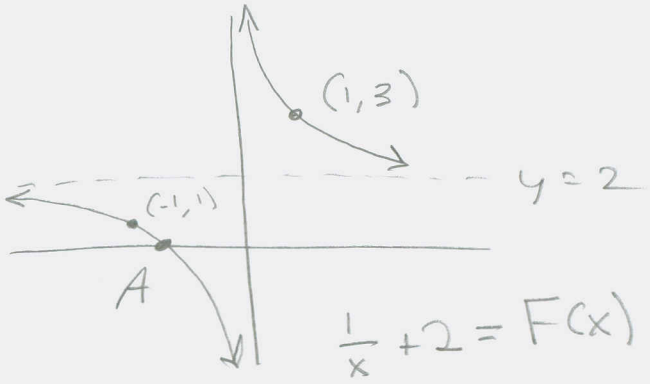
MAT 121 S 3.2 #s 29, 34, 39, 42, 45, 50

#s 29-40 Graph Each Rational Function using Transformations

(29) $F(x) = 2 + \frac{1}{x}$

$f(x) = \frac{1}{x} \Rightarrow F(x) = f(x) + 2$, i.e., up 2.





To Find A = x-intercept:

$\frac{1}{x} + 2 = 0$

$x\left(\frac{1}{x} + 2 = 0\right)$

$x \cdot \frac{1}{x} + x \cdot 2 = x \cdot 0$

$1 + 2x = 0$

$2x = -1$

$x = -\frac{1}{2} \rightsquigarrow \boxed{\left(-\frac{1}{2}, 0\right) = A}$

MAT 121 S 3.2 #s 13, 16, 29, 34, 39, 42, 45, 50

#s 11-22 FIND THE DOMAIN OF EACH RATIONAL FUNCTION

(13) $H(x) = \dfrac{-4x^2}{(x-2)(x+4)}$. NEED: $(x-2)(x+4) \neq 0$

METHOD 1

Solve $(x-2)(x+4)=0$

$\Rightarrow x-2=0$ OR $x+4=0$

$\Rightarrow x=2$ OR $x=-4$

EXCLUDE ANSWER

$\boxed{\mathcal{D} = \mathbb{R} \setminus \{-4, 2\}}$

IS FINE

METHOD 2

Solve

$(x-2)(x+4) \neq 0$

$\Rightarrow x-2 \neq 0$ AND $x+4 \neq 0$

$\Rightarrow x \neq 2$ and $x \neq -4$

So $\mathcal{D}$ = same as before.

So is

$(-\infty, -4) \cup (-4, 2) \cup (2, \infty)$

So is

$\{x \mid x \neq -4 \text{ and } x \neq 2\}$

(16) $Q(x) = \dfrac{-x(1-x)}{3x^2+5x-2}$ NEED: $3x^2+5x-2 \neq 0$

Solve $3x^2+5x-2=0$

$(3x+?)(x+?)=0$

$\Rightarrow (3x-1)(x+2)=0$

$x \in \{\frac{1}{3}, -2\} \Rightarrow \boxed{\mathcal{D} = \mathbb{R} \setminus \{-2, \frac{1}{3}\}}$

OR $(-\infty, -2) \cup (-2, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$

OR $\mathcal{D} = \{x \mid x \neq -2 \text{ AND } x \neq \frac{1}{3}\}$

MAT 121 S'3.2 #s 34, 39, 42, 45, 50
#s 29-40, Graph etc. —

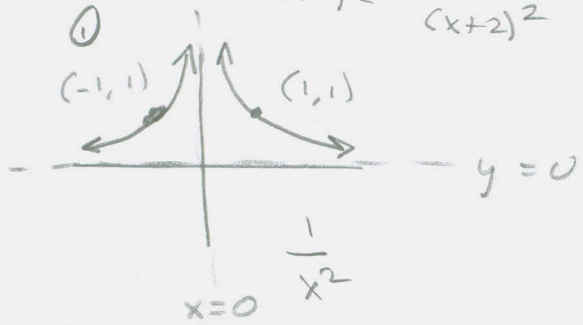
(34) $G(x) = \frac{2}{(x+2)^2}$

$f(x) = \frac{1}{x^2}$ is basic func,

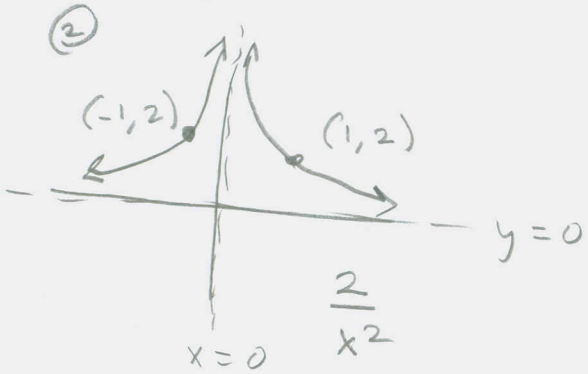
so $G(x) = \frac{2}{(x+2)^2}$ is $2f(x+2)$

↑ Vertical stretch ↑ Horizontal shift.

①



②



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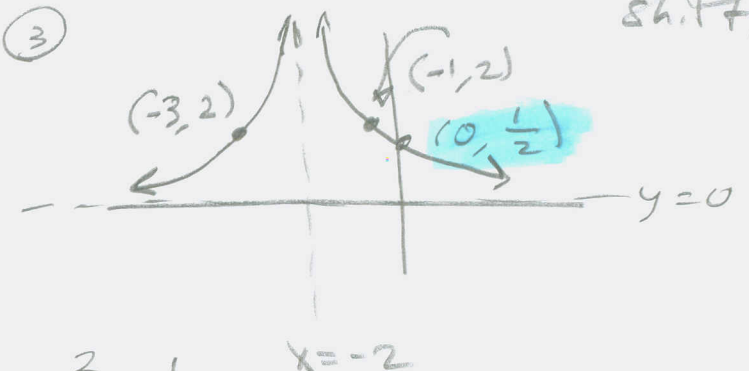


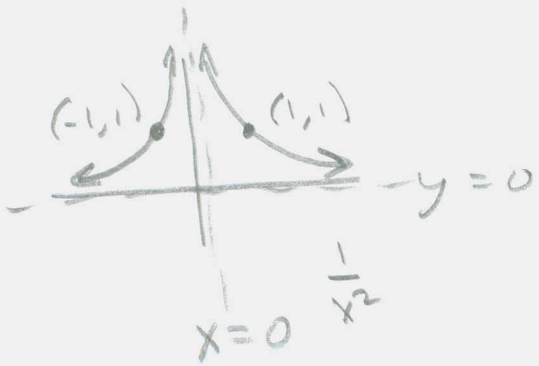
$G(0) = \frac{2}{(0+2)^2} = \frac{2}{4} = \frac{1}{2}$

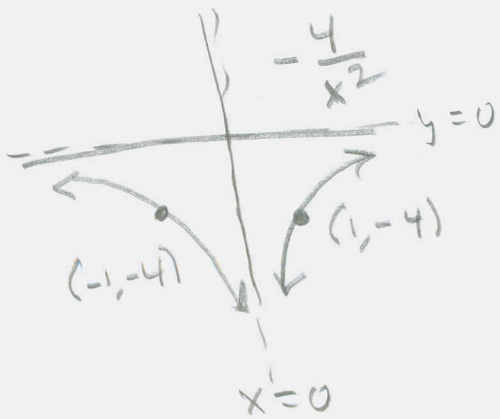
⇝ $(0, \frac{1}{2})$ is y-int.

(39) $R(x) = \frac{x^2-4}{x^2} = \frac{x^2}{x^2} - \frac{4}{x^2} = 1 - \frac{4}{x^2} = -\frac{4}{x^2} + 1$

$f(x) = \frac{1}{x^2} \longrightarrow R(x) = -4f(x) + 1$

↑ Reflect & stretch ↑ up 1

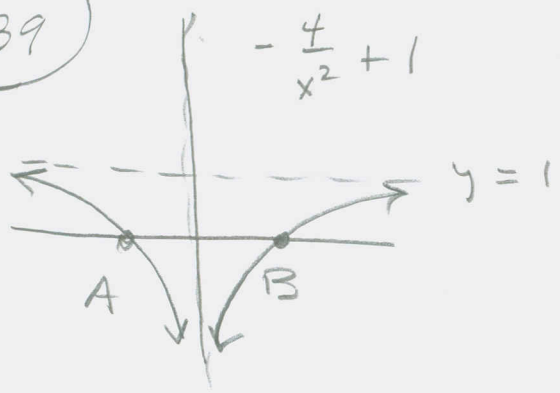




OVER →

MAT 121 S'3.2 #s 39, 42, 45, 50

(39)



To find A & B:

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

$$x^2\left[-\frac{4}{x^2}+1=0\right] \Rightarrow$$

$$-\frac{4}{x^2}\cdot x^2+1\cdot x^2=0\cdot x^2 \Rightarrow$$

$$-4+x^2=0 \Rightarrow$$

$$x^2-4=0 \Rightarrow$$

METHOD 2:

$$(x-2)(x+2)=0 \Rightarrow$$

$x=2$ OR $x=-2$

See Work, below:

$A=(-2,0)$

$B=(2,0)$

METHOD 1:

$$x^2=4$$

$$\Rightarrow x=\pm 2$$

#s 41-52 Find Vertical, Horizontal, Oblique asymptotes

V.A., H.A., O.A.

(42) $R(x)=\frac{3x+5}{x-6}$

V.A.: $x-6=0$

$\Rightarrow$ $x=6$ is V.A.

H.A.: Degree of numerator is same as denominator: $y=\frac{3}{1}=3$ $\Rightarrow$ $3=y$ is H.A.

O.A.: Since there is a horizontal asymptote, there is no Oblique Asymptote.

MAT 121 § 3.2 #s 45, 50

(45) $T(x) = \dfrac{x^3}{x^4 - 1}$ is proper. H.A.: $y = 0$

V.A.: $x^4 - 1 = 0$

Let $u = x^2$. Then

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

$= u^2 - 1 \overset{\text{SET}}{=} 0$

$\Rightarrow u = \pm 1$

$\Rightarrow x^2 = \pm 1$

$x^2 = 1 \Rightarrow$ $x = \pm 1$

$x^2 = -1 \Rightarrow$ No Real solution

V.A.: $x = 1, x = -1$

(50) $R(x) = \dfrac{6x^2 + x + 12}{3x^2 - 5x - 2}$

H.A.: $y = \frac{6}{3} = \boxed{2 = y}$

V.A. $3x^2 - 5x - 2 = 0$

$\Rightarrow (3x + 1)(x - 2)$

$\Rightarrow 3x + 1 = 0$ OR $x - 2 = 0$

$\Rightarrow 3x = -1$

$\rightarrow \boxed{x = -\frac{1}{3} \text{ OR } x = 0 \text{ are V.A.}}$