Download this PDF to your computer and go to
www.livescribe.com/player
On iOS, open the PDF in Livescribe+.

- Return Graded Work: Oct 23, 2018
- Announcements:
  ① Math Party Thurs 10/25 1pm-2:15pm in the Building 6 Breezeway
  ② Extra Credit Wednesday (tomorrow) 10/24 4:30-5:30 pm in 4-235 (on §5.3)
  - All of §5.3 The Graph of a Rational Function (pp 69-70)
  - All of §8.1 System of Linear Equations: Substitution and Elimination (p. 116)
  - Start §8.6 Systems of Nonlinear Equations · Sub & Elim (pp. 117-?)

* 7 days until the Chapter 4 and 5 Test → To study, complete the Chapter 4 and 5 Test Practice Problems over and over until you can complete each one correctly, quickly, and correctly, with the ability to explain Why each problem is solved that way.

§5.3 The Graph of a Rational Function

We need to recognize the graph of a rational function (not creating it), following all of the steps (7 steps)

(#) 5.33 · $R(x) = \frac{x^2+x-72}{x^2-x-56}$

① Step 1 · Domain · Ignore numerator

$x^2-x-56 \neq 0$

$(x-8)(x+7) \neq 0$

$x-8 \neq 0$ $\quad x+7 \neq 0$

$x \neq 8$ $\quad x \neq -7$

$\{x \mid x \text{ is real}, x \neq 8, -7\}$

livescribe

- Return Graded Work: Oct 23, 2018
- Announcements:
  ① Math Party Thurs 10/25 1pm-2:15pm in the Building 6 Breezeway
  ② Extra Credit Wednesday (tomorrow) 10/24 4:30-5:30 pm in 4-235 (on §5.3)
  - All of §5.3 The Graph of a Rational Function (pp 69-70)
  - All of §8.1 System of Linear Equations: Substitution and Elimination (p. 116)
  - Start §8.6 Systems of Nonlinear Equations: Subs & Elim (pp. 117-?)

* 7 days until the Chapter 4 and 5 Test → To study, complete the Chapter 4 and 5 Test Practice Problems over and over until you can complete each one correctly, quickly, and correctly, with the ability to explain Why each problem is solved that way.

§5.3 The Graph of a Rational Function

We need to recognize the graph of a rational function (not creating it), following all of the steps (7 steps)

(#) 5.3.3 · $R(x) = \dfrac{x^2 + x - 72}{x^2 - x - 56}$

① Step 1 · Domain:
Ignore numerator

$x^2 - x - 56 \neq 0$
$(x-8)(x+7) \neq 0$
$x - 8 \neq 0$ $\quad$ $x + 7 \neq 0$
$x \neq 8$ $\quad$ $x \neq -7$

$\{x \mid x \text{ is real}, x \neq 8, -7\}$

⑤

Step 2 $R(x) = \frac{x^2+x-72}{x^2-x-56} \overset{\text{factor}}{=} \frac{(x+9)(x-8)}{(x-8)(x+7)}$

Reduced $R(x) = \frac{x+9}{x+7}$ → reduced denominator polyn

$x+7 \overset{\text{set}}{=} 0$

$x = -7$

vertical asymptote

③ $\frac{1)\ x^2+x-72}{1)\ x^2-x-56}$ ← deg 2, ← deg 2 } CASE A ⇒ horizontal asymptote $y = b$

$1 \cdot 1 = 1 \Rightarrow b$

so, $y = 1$

Graph analyzing:

Step 1 : $\{x \mid x \text{ is real}, x \neq 8, -7\}$

Step 2 : $x - 8 \overset{\text{set}}{=} 0$ → $x = 8$ is where the hole is.

(cancelled factor) To find y-coord, plug into Reduced $R(x)$

$R(x) = \frac{x+9}{x+7}$ (reduced $R(x)$)

$R(8) = \frac{8+9}{8+7} = \frac{17}{15}$ $\left(8, \frac{17}{15}\right)$ → this is the only hole in this graph.

Answer is graph (B).

} Vertical asymptote = for x of not cancelled factors
} Hole : for x of cancelled factors (each cancelled factor will create a hole in the graph).

#5.3 17 Analyse $k(x) = \dfrac{x^2}{x^2+x-12}$

(a) Domain:
Ignore the numerator $\Rightarrow$ $x^2+x-12 \neq 0$

$(x+4)(x-3) \neq 0$

$x+4 \neq 0$: $x \neq -4$

$x-3 \neq 0$: $x \neq 3$

So, Domain is:
$\{x \mid x \text{ is real}, x \neq -4, 3\}$

(b) Equation ~~for~~ the vertical asymptote

$\dfrac{x^2}{x^2+x-12} = \dfrac{x \cdot x}{(x+4)(x-3)}$ → nothing to cancel, so this means that there's no holes in this graph.

$(x+4)(x-3) = 0$

$x+4=0$: $x=-4$

$x-3=0$: $x=3$

→ 2 vertical asymptotes

(c) $\dfrac{(1)x^2}{(1)x^2+x-12}$ ← deg 2 / ← deg 2 } CASE A $\Rightarrow$ horizontal asymptote $y=b$, $y=1$ ↳ $1 \cdot 1 = 1$

(d) Step 1 : $\{x \mid x \text{ is real}, x \neq -4, 3\}$

Step 2 : lowest terms $= \dfrac{x^2}{(x+4)(x-3)}$ → no holes

Step 3 : Intercepts

y-int ($x=0$) → Plug $x=0$ into Reduced $R(x)$

$R(0) = \dfrac{0^2}{(0+4)(0-3)} = 0$ $(0,0)$ (x y)

x-int $(y=0)$ → Plug ~~in~~ $y=0$ into Reduced R(x,

$$0 = \frac{x^2}{(x+4)(x-3)}$$

$0 = x^2$

$0 = x^2$

$0 = (x)(x)$

$x=0$ $x=0$

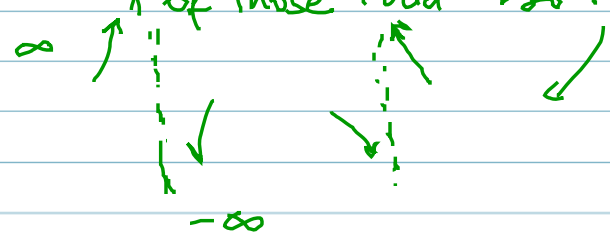
(the only way a fraction is $=0$ is when its numerator is 0 → so, $x^2=0$ in this case)

$x=0$, multiplicity 2 (even)

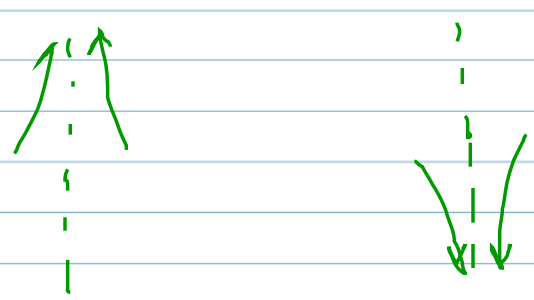
Step 4 : $\underbrace{x=-4}$ $x=3$

This came from factor $\underbrace{(x+4)}$

1 of those : odd → so :



factor $(x+2)^2$



OBS:

A curve can intercept a horizontal or an oblique asymptote, but can never intercept a vertical asymptote.

↓

So, which asymptotes can be intercepted?

V: no H: yes O: yes

Steps: ~~y=0~~

$y = 1$ (horizontal)

$y = 1$ intersect $y = \dfrac{x^2}{x^2+x-12}$

$1 = \dfrac{x^2}{x^2+x-12}$

$1 = \dfrac{x^2}{x^2+x-12}$

$1 \cdot x^2 = 1(x^2+x-12)$

$x^2 = x^2+x-12$

$-x^2 \quad -x^2$

$0 = x-12$

$x = 12$

$y = 1$ → The only place $R(x)$ intersects $y=1$ is at $(12, 1)$

So, the only graph that can have this is (A).

5337 Analyse $R(x) = \dfrac{x^2+8x+7}{x+1}$

(a) Domain:

Ignore the numerator

$x+1 \neq 0$

$x \neq -1$

$\{x \mid x \text{ is real}, x \neq -1\}$

(b) Vertical asymptote:

$$R(x) = \frac{x^2+8x+7}{x+1} = \frac{(x+1)(x+7)}{x+1} = x+7$$

no denominator, no vertical asymptote

$\{x \mid x \text{ is real}, x \neq -1\}$

hole

(c) horizontal or oblique

$\frac{x^2+8x+7}{x+1}$ ← deg 2 ← deg 2 } case c → Polynomial long division (we are looking for the oblique asymptote)

$$x+1 \overline{)\, x^2+8x+7}$$

$-x^2 - x$

$7x + 7$

$-7x - 7$

0

$\frac{x^2}{x} = x$

$x(x+1) = x^2 + x$

↳ No remainder = no oblique asymptote

Step 2. Where's the hole?

$x = -1$

$y = -1+7$

$y = 6$

$(-1, 6)$

hole

§8.1 → Revision (Extra Credit Workshop tomorrow)

§8.2

8.2.17 → method : substitution

8.2.20 → method : elimination

8.2.5 → method : the problem asks for elimination.