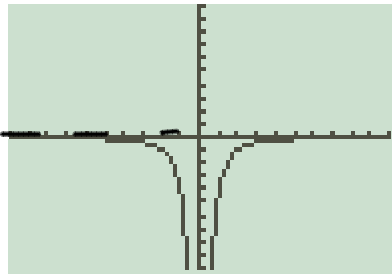
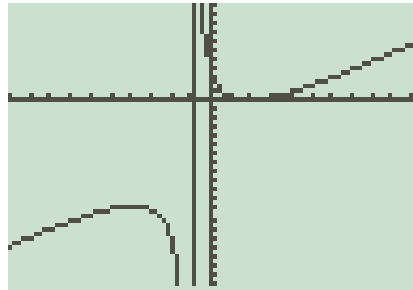


rational functions



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



$$g(x) = \frac{x^2 - 4x + 3}{x + 1}$$

homework questions?

today's menu

1. polish off **rational functions** (\$2)
2. gobble up **rational inequalities** (\$5)



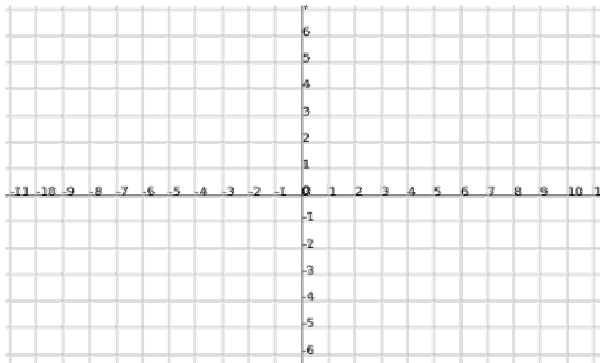
from a quick analysis of a rational function,
we can find out a lot!

- 1.
- 2.
- 3.
- 4.
- 5.

To polish this off, I want
you to be able to do this
analysis by plotting these
critical things (asymptotes
and intercepts) on a
graph. Then you can use
your graphing calculator
to "check" and do the rest.

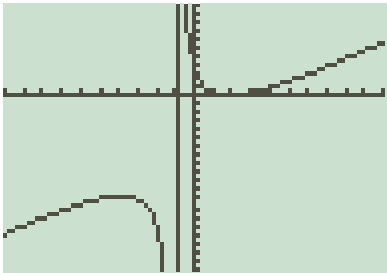
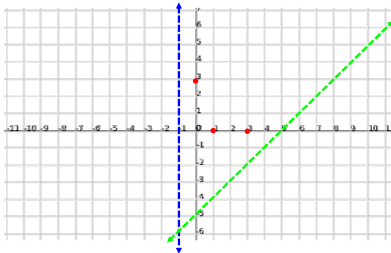
$$g(x) = \frac{x^2 - 4x + 3}{x + 1}$$

VA: $x = -1$ **x-intercept:** $(1,0)$ $(3,0)$
HA: none **y-intercept:** $(0,3)$
OA: $y = x - 5$



$$g(x) = \frac{x^2 - 4x + 3}{x + 1}$$

VA: $x = -1$ **x-intercept:** $(1,0)$ $(3,0)$
HA: none **y-intercept:** $(0,3)$
OA: $y = x - 5$



check yo'self!

Find the asymptotes and intercepts. See if you can't make a rough sketch!

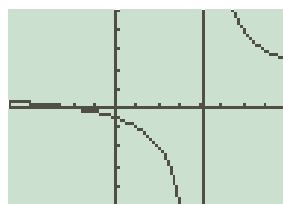
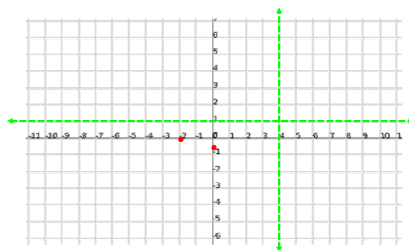
$$g(x) = \frac{x + 2}{x - 4}$$

check yo'self!

Find the asymptotes and intercepts. See if you can't make a rough sketch!

$$g(x) = \frac{x + 2}{x - 4}$$

VA: $x=4$ x-intercept: $(-2,0)$
HA: $y=1$ y-intercept: $(0,-1/2)$
OA: none



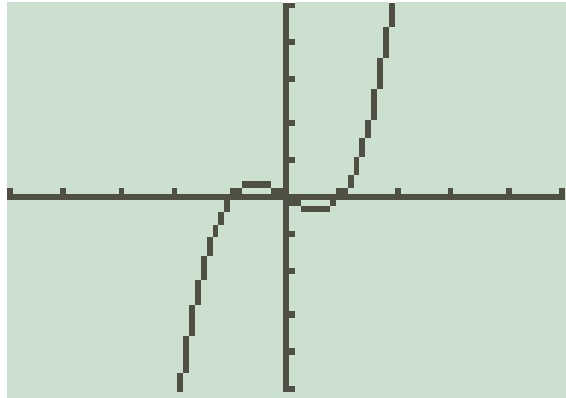
rational inequalities (\$5)

On your graphing calculator, graph:

$$f(x) = x^3 - x$$

Find when the function is greater than 0.

$$f(x) = x^3 - x$$



That question that we just answered is the same as asking and answering:

find when $x^3 - x > 0$

I'm going to show you a
quick way to solve
it.*

*you can thank me later

I'm going to show you a
quick way to solve
it.*

- 1. find the zeros and plot them on a number line**
- 2. test each interval (+/-)**

*you can thank me later

$$x^3 - x = 0.$$

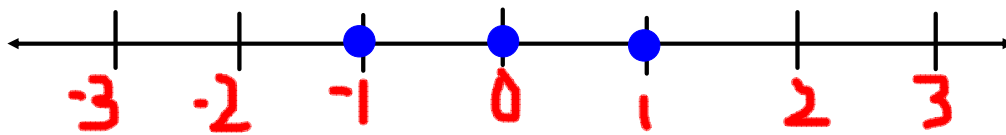
$$x(x^2 - 1) = 0$$
$$x(x+1)(x-1) = 0$$

zeros: 0, -1, 1

$$x^3 - x = 0.$$

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

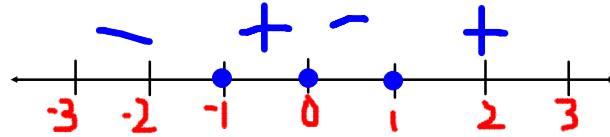
zeros: 0, -1, 1



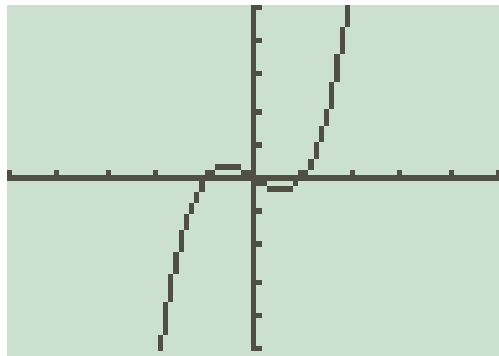
$$x^3 - x = 0.$$

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

zeros: 0, -1, 1



so $x^3 - x > 0$ is greater than 0 for $(-1, 0) \cup (1, \infty)$



check yo'self!

Find when $x^2 + x - 2 \geq 0$

Synthesis!

The average cost per DVD in dollars, for a company to produce x DVDs on exercising is given by the function:

$$A(x) = \frac{2x + 100}{x}$$

(a) Graph the function on the interval $(0, \infty)$ and complete the following:

$A(x) \dashrightarrow$ $\text{as } x \dashrightarrow \infty$

(b) Explain the meaning of the answer to (a) in terms of the application.

**last topic:
RATIONAL INEQUALITIES**

hooray!

Find when $\frac{x - 3}{x + 4} \geq \frac{x + 2}{x - 5}$

step 0: bring everything to one side of the inequality.

step 1: find when the denominators are 0 (critical value)

step 2: find when the function is 0 (review 2.5)

THESE ARE YOUR **CRITICAL VALUES**

step 3: test each region between the critical values

Find when $\frac{x - 3}{x + 4} \geq \frac{x + 2}{x - 5}$

step 0: bring everything to one side of the inequality.

$$\frac{x - 3}{x + 4} - \frac{x + 2}{x - 5} \geq 0$$

Find when $\frac{x-3}{x+4} \geq \frac{x+2}{x-5}$ $\left| \right| \quad \frac{x-3}{x+4} - \frac{x+2}{x-5} \geq 0$

step 1: find when the denominators are 0 (critical value)

$$x = -4; x = 5$$

Find when $\frac{x-3}{x+4} \geq \frac{x+2}{x-5}$ $\left| \right| \quad \frac{x-3}{x+4} - \frac{x+2}{x-5} \geq 0$

step 2: find when the function is 0 (review 2.5)

$$\frac{x+5}{x+5} \frac{x-3}{x+4} - \frac{x-4}{x-4} \frac{x+2}{x-5} \geq 0$$

$$(x+5)(x-3) - (x-4)(x+2) = 0$$

$$x^2 + 2x - 15 - (x^2 - 2x - 8) = 0$$

$$-14x + 7 = 0$$

Yay!

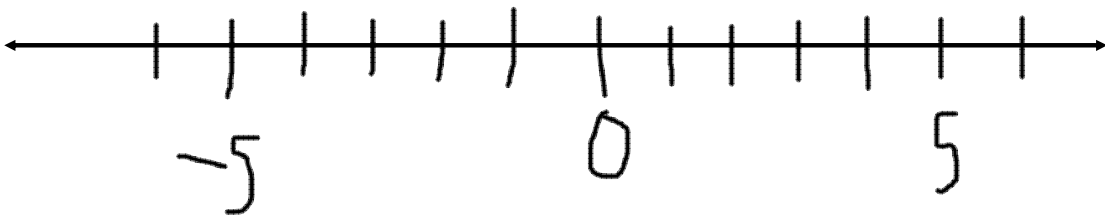
$$x = 1/2$$

your critical values are:

$$x = -4, 5, \text{ and } 1/2.$$

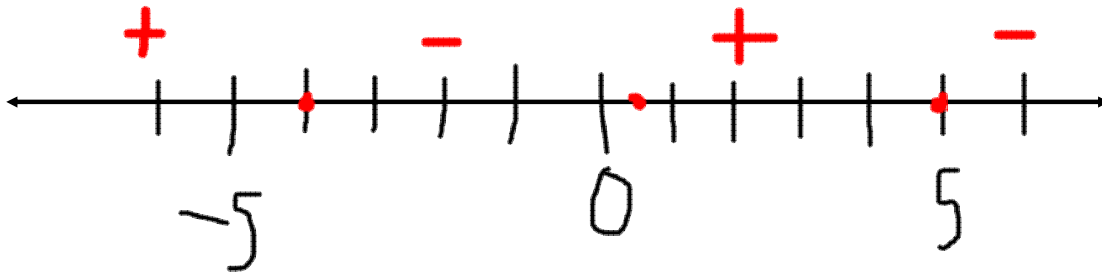
step 3: test each region between the critical values

$$\frac{x - 3}{x + 4} - \frac{x + 2}{x - 5} \geq 0$$



step 3: test each region between the critical values

$$\frac{x-3}{x+4} - \frac{x+2}{x-5} \geq 0$$



so $(-\infty, -4) \cup [1/2, 5)$



are these open?

Find when $\frac{x-3}{x+4} \geq \frac{x+2}{x-5}$

homework:

Section 3.5#31, 32, 52, 53, 75

Section 3.6#

Part I:1-10,

PART II: 15-21 odd

PART III: 43-49 odd

