PreCalc 11 - Chp 8 Review/Ref Sheet

Note Title 2015-09-24

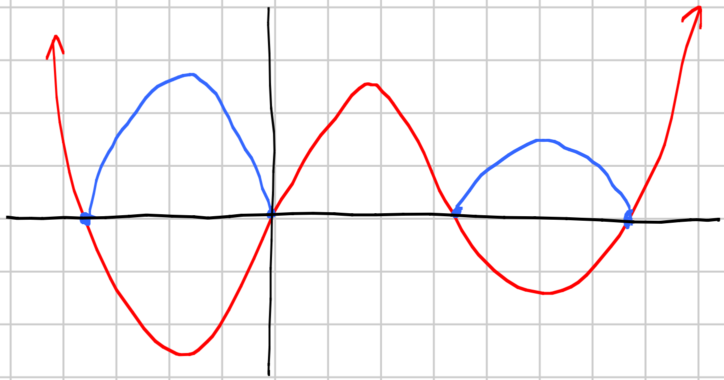
Syntax: $y = |f(x)|$ Treat $|\_|$ as ( ) for order of operations.

Piecewise: $|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$

$|f(x)| = \begin{cases} f(x), & \text{if } f(x) \geq 0 \\ -f(x), & \text{if } f(x) < 0 \end{cases}$

Graphically: All we want to do is reflect on the x-axis, any intervals of negative values, if graph is given

eg)



Graphically: You could get up to double the amount of solutions.

eg) $g(x) = |f(x)|$, we need to solve & check $g(x) = f(x)$ & $g(x) = -f(x)$

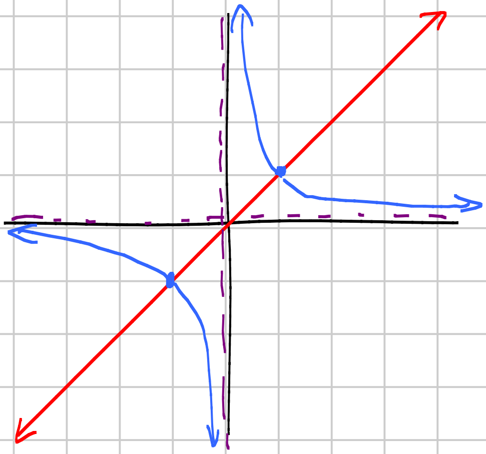
Make sure you adjust the window so that you don't miss any solutions. Finally, use the 'intersect' calculation, not 'intercept'

Solving Algebraically: Recall if we have $g(x) = |f(x)|$, we have to solve $g(x) = f(x)$ & $g(x) = -f(x)$ and check for extraneous roots.

Different ways to check extraneous:

- determine domain & check if solution is in domain
- determine if $g(x) < 0$, then it is extraneous
- plug solution in and check if $g(x) = |f(x)|$

Let start with the basic: $f(x) = x$, so $g(x) = \frac{1}{x}$



It's best to reason how we graph this.
As $x \to$ large, $1/x$ gets smaller.
As $x \to 0$, $1/x$ get larger.
The same happens when $x<0$, but all the values are negative

Vertical asymptote: $x = 0$
This is where the values go to $\pm\infty$. Also $1/0$ is undefined
Horizontal asymptote: $y=0$
This is where the values get close to when $x = \pm\infty$

D: $x \neq 0$
R: $y \neq 0$

Invariant Points: $g(a) = 1/f(a) = f(a)$, so $f(a) = \pm 1$

The NPV is where the V.A. is.
For any $f(x) = ax+b$ and $g(x) = 1/f(x)$: NPV: $x = -b/a$

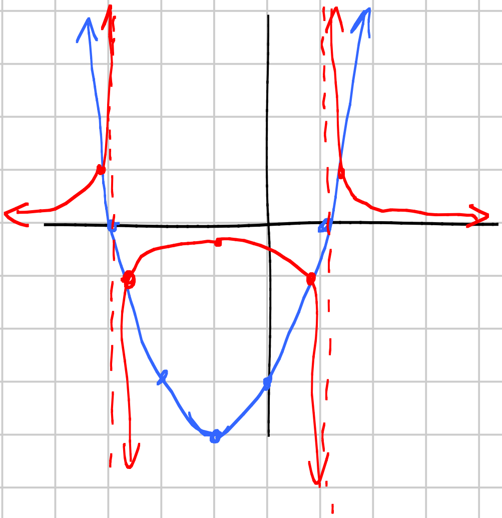
To predict the number of VA's, you should think about how many roots are in $f(x)$, where $g(x) = \frac{1}{f(x)}$.

Recall that in general form, you should use the discriminant. In factored form, count the number of non-repeated roots. In standard (vertex) form, check '$a \cdot q$': <0, 2 VA's; $=0$, 1 VA; >0, no VA's.

Horizontal asymptote is always $y=0$. If '$a>0$' the reciprocal function will approach HA from above. If '$a<0$', then it will approach from below.
There are two ways to graph the reciprocal function: graph the quadratic function and use the key points or use a table of values of the quadratic and reciprocal functions.

It's not always easy to find invariant points algebraically, so graph quadratic as accurately as possible, then find where $y = \pm 1$.

eg) Graph the reciprocal of $y = x^2 + 2x - 3$



$y = (x+3)(x-1)$

VA: $x = -3$, $x = 1$

axis of symmetry: $\frac{-3+1}{2} = -1$

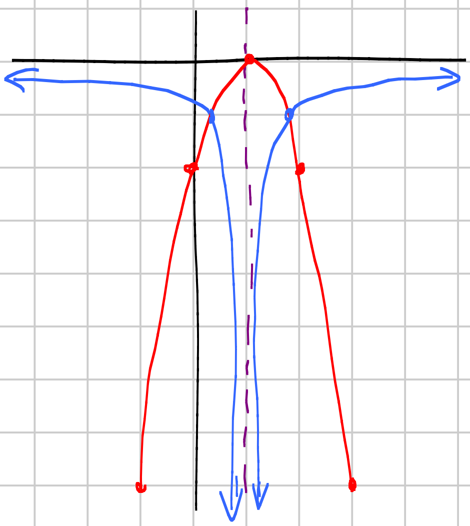
$x = -1$

vertex: $(-1+3)(-1-1) = 2(-2) = -4$

$(-1, -4)$

Then plot invariant points and use asymptotes.

eg) Graph the reciprocal of $y = -2(x-1)^2$



Plot VA first.

Plot invariant points, then use asymptotes.