4.5 Bringing It All Together: Sketching Curves

What we have learned thus far:

From the First Derivative:

How to find Critical Values (set $f'(x)=0$ and solve for x)

How to find intervals of **increase**/**decrease** $\left(f'(x)>0,\ f'(x)<0\right)$

How to show if a c.v. is the location of a max or min (First Derivative Test)

From the Second Derivative

How to find **Possible** Points of Inflection $\left(f''(x)=0\right)$

How to find intervals where a function is **concave up**/**concave down**

$\left(f''(x)>0,\ f''(x)<0\right)$

How to test c.v.'s for max/min (Second Derivative Test)

Asymptotes

Rational Functions may have:

Vertical Asymptotes: $\lim_{x\to a}\left(f(x)\right)=\infty,\ \Rightarrow x=a$ is a V.A.

Horizontal Asymptotes: $\lim_{x\to\infty}\left(f(x)\right)=b,\ \Rightarrow y=b$ is a H.A.

Oblique Asymptotes: If $f(x)=\dfrac{\text{degree }(n+1)}{\text{degree } n}$

Algorithm for Sketching Curves

We must:

1) Find all intercepts
2) Find all c.v.'s
3) Find all asymptotes
4) Determine all P.P.O.I.
5) Determine all special **points**
6) Analyze all information in an Interval Chart
7) Sketch the curve.

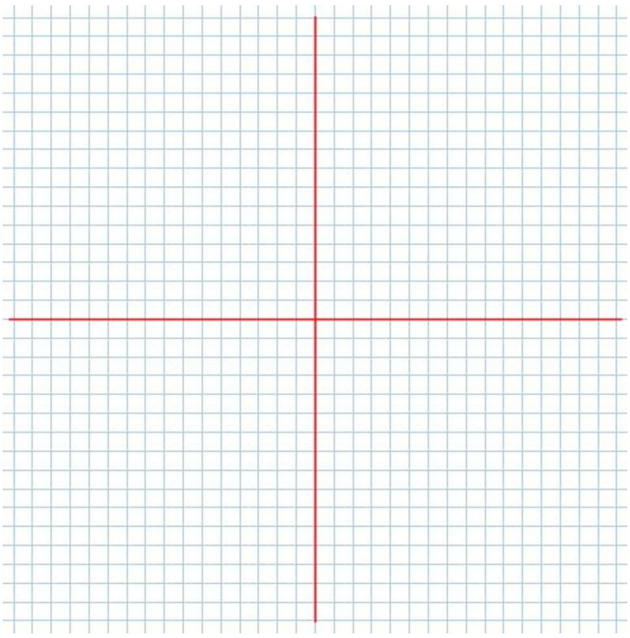
Note: **All** (*infinitely many*) possible functions can be sketched using a combination of **FOUR BASIC SHAPES:**

increasing/ccd decreasing/ccd decreasing/ccu increasing/ccu

Your Interval Chart will look like:

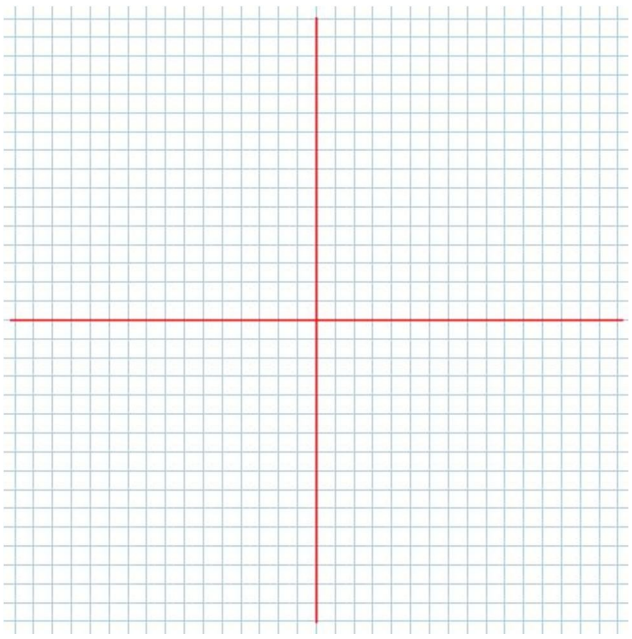
Example 4.5.1

Sketch $f(x) = x^4 - 8x^2 + 7$



Example 4.5.2

Sketch $g(x)=\dfrac{x^2+1}{4x^2-9}$



Class/Homework for Section 4.5

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