

Graphing Functions

We need to combine all the information we can find from $f(x)$, $f'(x)$ and $f''(x)$ in order to sketch a graph of $f(x)$.

From $f(x)$ we can determine

1. The domain and points of discontinuity
2. Horizontal and vertical asymptotes.
3. X and y intercepts
4. The symmetry of the function
5. Some important function values.

From $f'(x)$ we can determine

1. critical points
2. when $f(x)$ is increasing
3. when $f(x)$ is decreasing

From $f''(x)$ we can determine

1. Points of inflection
2. when $f(x)$ is concave up
3. when $f(x)$ is concave down.

FOR $f(x) = \frac{N}{D}$

DOMAIN ($\sqrt{\quad}$, $\frac{N}{0}$)

X.I (when $y=0, N=0$)

Y.I (when $x=0$)

VA ($\frac{N}{0}$)

H.A ($\lim_{x \rightarrow \infty} \frac{N}{D}$)

FOR $f'(x) = \frac{N_1}{D_1}$

CRITICAL POINTS

A: $f'(x) = 0$ (when $N_1 = 0$)

B: $f'(x)$ DNE (when $D_1 = 0$)

INCREASING (when $f'(x) \geq 0$)

DECREASING (when $f'(x) \leq 0$)

FOR $f''(x) = \frac{N_2}{D_2}$

POINTS OF INFLECTION

A: $f''(x) = 0$ or $f''(x)$ DNE

(when $N_2 = 0$ or $D_2 = 0$)

B: CONCAVITY CHANGES

CONCAVE UP (when $f''(x) > 0$)

CONCAVE DOWN (when $f''(x) < 0$)

1 Sketch $f(x) = \frac{1-x}{(x+1)^2}$ given $f'(x) = \frac{x-3}{(x+1)^3}$ and $f''(x) = \frac{10-2x}{(x+1)^4}$

$F(x)$

Domain $x \neq -1$

XI (1, 0)

YI (0, 1)

VA $x = -1$

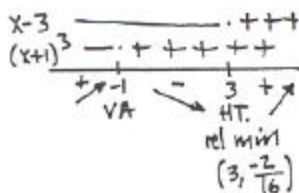
HA $y = 0$

$F'(x)$

Critical points H.T. at $x = 3$

Inc. $[-\infty, -1) \cup [3, \infty)$

Dec. $[-1, 3]$



$F''(x)$

Points of inflection $x = 5$

concave up $(-\infty, -1) \cup (-1, 5)$

concave down $(5, \infty)$

