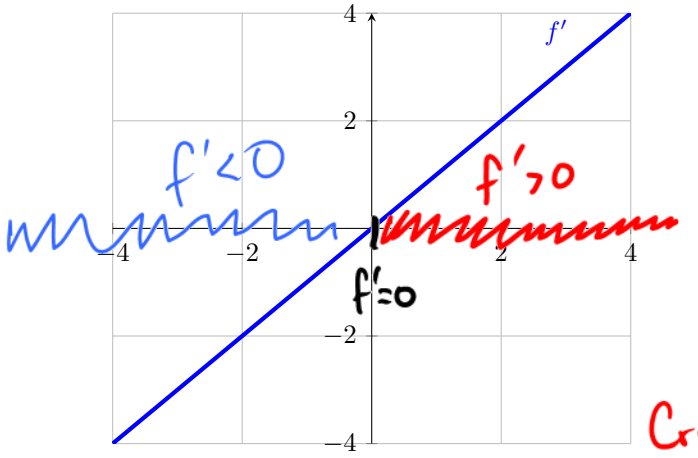
Goal: Recover information about a function f from the graph of f'.

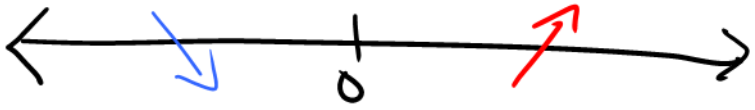
1 Inc/Dec

$f'>0 \leftarrow$ Above the x-axis
$f'<0 \leftarrow$ Below the x-axis

Problem 1. *Use the graph of f' to determine the following about f:*



(a) Intervals of increase/decrease



Inc: $(0, \infty)$

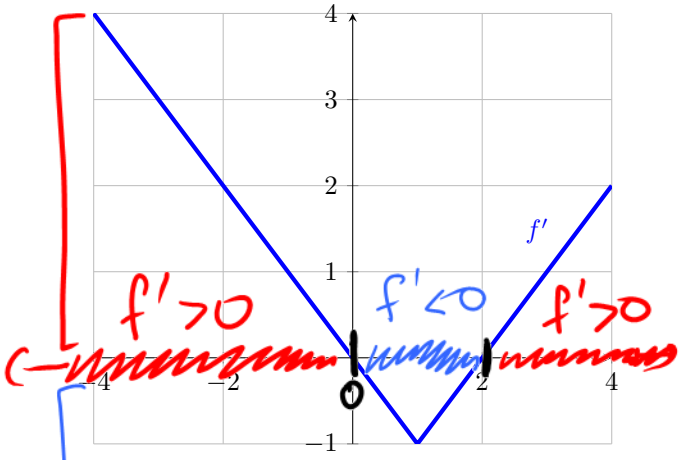
Dec: $(-\infty, 0)$

(b) Positions of relative max/mins

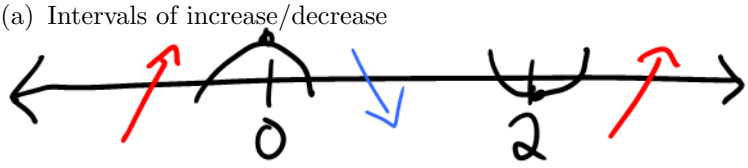
Crit Nums: $f'=0 \leftarrow$ when f' touches the x-axis

f has a rel min at x=0 by the 1st Derivative Test.

Problem 2. *Use the graph of f' to determine the following about f:*



(a) Intervals of increase/decrease



Inc: $(-\infty, 0) \cup (2, \infty)$

Dec: $(0, 2)$

(b) Positions of relative max/mins

By the 1st Derivative Test

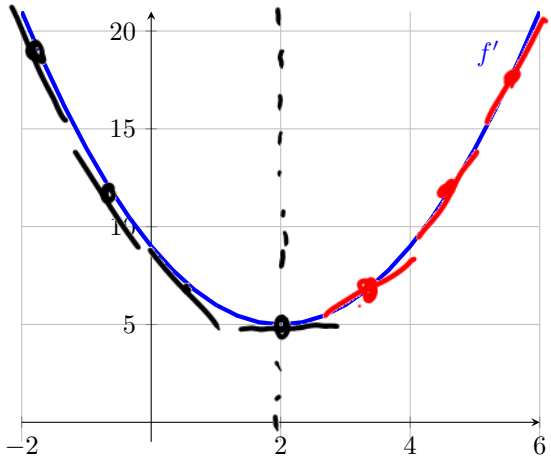
f has a rel. max at x=0

f has a rel. min at x=2

2 Concavity

Problem 3. *Use the graph of f' to determine the following about f:*

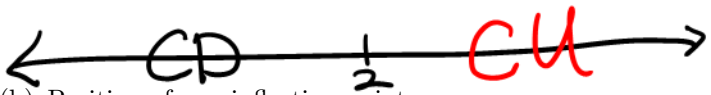
$0 < f'' = [f']'$



(a) When f is concave up VS. concave down

CU : $(2, \infty)$

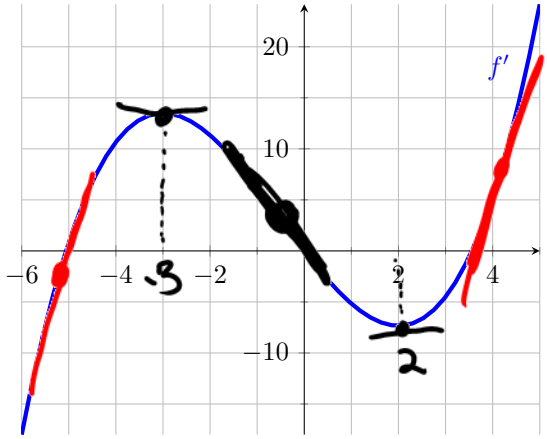
CD : $(-\infty, 2)$



(b) Position of any inflection points

There is an inflection point at $x = 2$

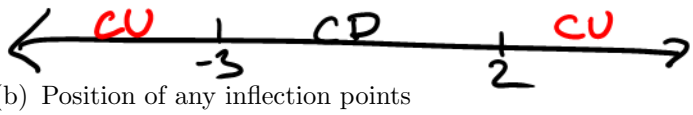
Problem 4. *Use the graph of f' to determine the following about f:*



(a) When f is concave up VS. concave down

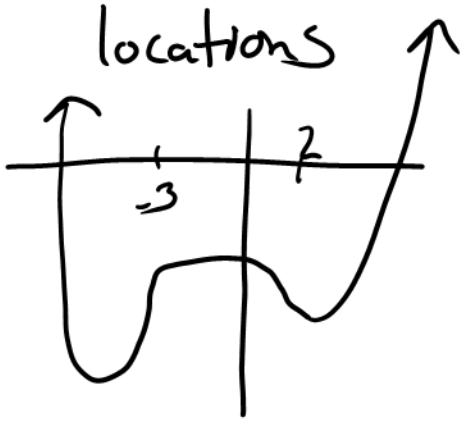
CU: $(-\infty, -3)$ $(2, \infty)$

CD: $(-3, 2)$



(b) Position of any inflection points

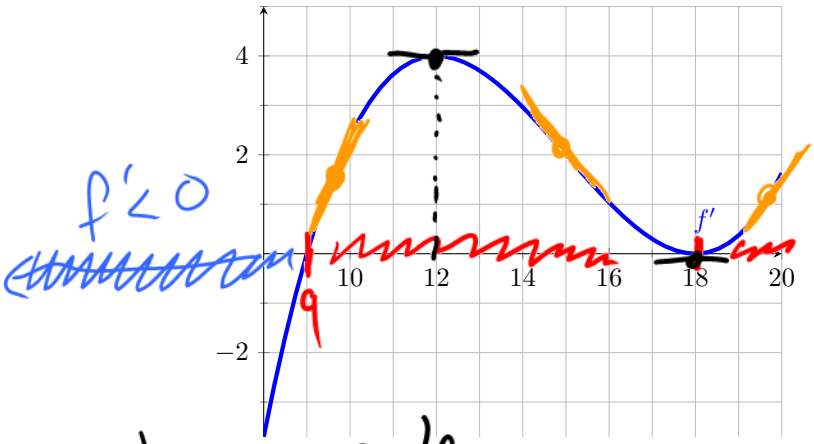
Both $x = -3$ and $x = 2$ are locations of inflection points



3 Putting Everything Together

Problem 5. *Use the graph of f' to determine the following about f:*

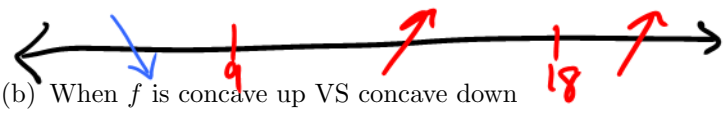
In Achieve: $(9, \infty)$



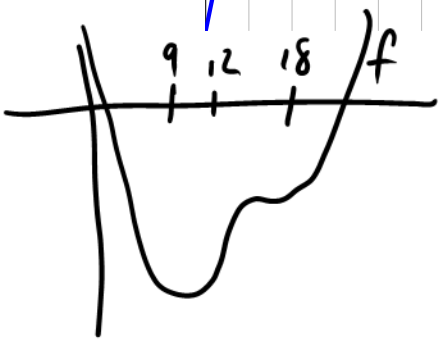
(a) Intervals of Increase/Decrease

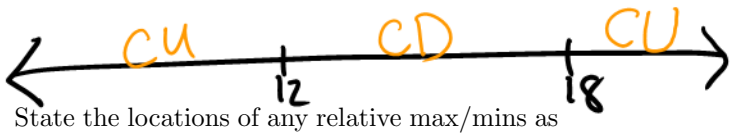
Inc: $(9,\infty) \setminus \{18\}$; $(9,18) \cup (18,\infty)$

Dec: $(-\infty, 9)$



(b) When f is concave up VS concave down





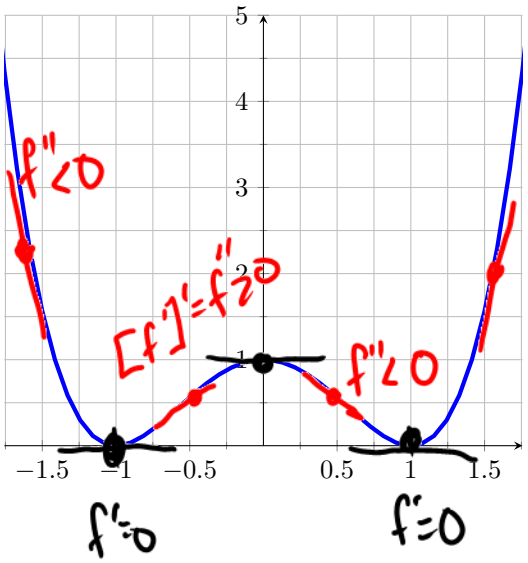
(c) State the locations of any relative max/mins as well as inflection points

Rel min at $x = 9$

Inflection Points at $x = 12, 18$

Problem 6. *Use the graph of f' to determine the following about f:*

In achieve: $(-\infty, \infty)$



(a) Intervals of Increase/Decrease

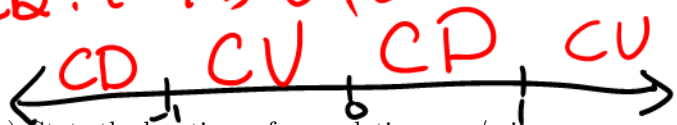
Inc: $(-\infty,-1) \cup (-1,1) \cup (1,\infty)$

Dec: None

(b) When f is concave up VS concave down

CU: $(-1,0) \cup (1,\infty)$

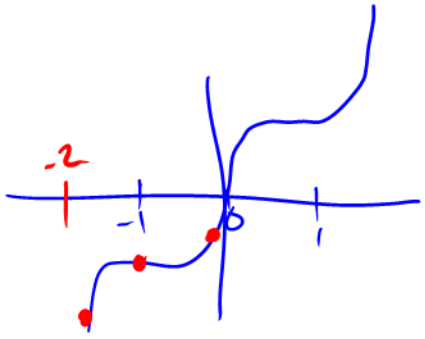
CD: $(-\infty,-1) \cup (0,1)$



(c) State the locations of any relative max/mins as well as inflection points

No Rel. Max / Min

Inflection Points at $x = -1, 0, 1$



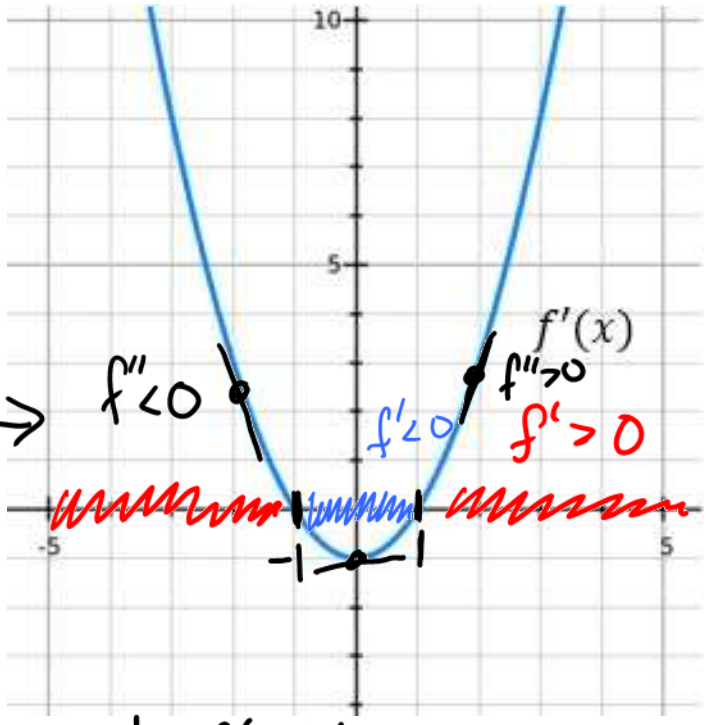
Question 4 of 7

Consider the graph of $f'(x)$, which represents the derivative of the function $f(x)$.

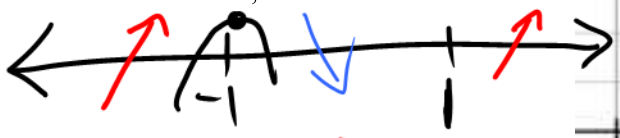
Answer the following questions regarding $f(x)$.

For (a.), (d.), (e.), and (h.), if there is more than one answer for a specific question, separate each answer from the following one using a comma. For (b.), (c.), (f.), and (g.), if there is more than one interval in an answer, separate each interval from the next by typing UNION to enter the ∪ symbol.

For any part, if no answer exists at all, enter NO SOLUTION.



1st $\frac{d}{dx}$ test:

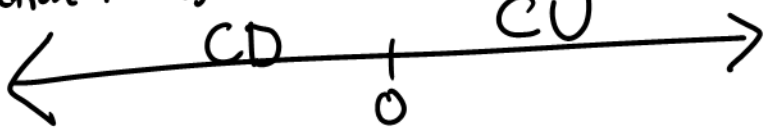


Inc: $(-\infty, -1) \cup (1, \infty)$

Dec: $(-1, 1)$

Rel Max at $x=-1$; Rel Min at $x=1$

Inflection Points



Inflection Point at $x=0$

(a.) Critical Number(s) =

(b.) Increasing Interval(s):

(c.) Decreasing Interval(s):

(d.) Relative Maxima Occur at x =

(e.) Relative Minima Occur at x =

(f.) Concave Up Interval(s):

(g.) Concave Down Interval(s):

(h.) Inflection Points Occur at x =

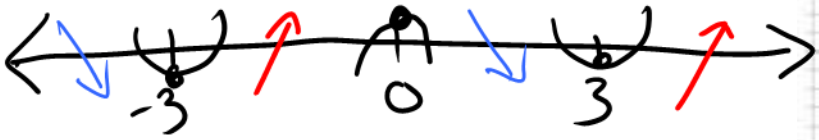
Question 5 of 7

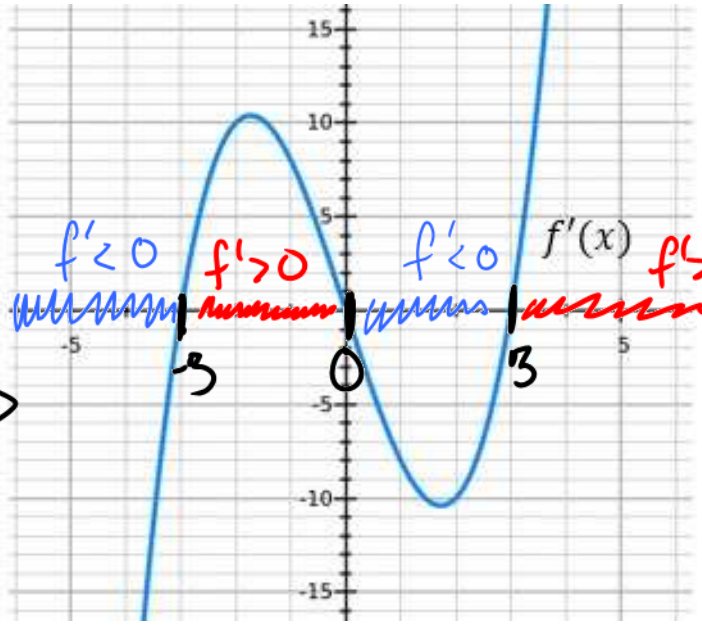
Consider the graph of $f'(x)$, which represents the derivative of the function $f(x)$.

Answer the following questions regarding $f(x)$.

For (a.), (d.), and (e.), if there is more than one answer for a specific question, separate each answer from the following one using a comma. For (b.) and (c.), if there is more than one interval in an answer, separate each interval from the next by typing UNION to enter the ∪ symbol.

For any part, if no answer exists at all, enter NO SOLUTION.





Inc: $(-3,0) \cup (3,\infty)$

Dec: $(-\infty,-3) \cup (0,3)$

Rel Min at $-3, 3$

Rel. Max at $x=0$

(a.) Critical Number(s) =

(b.) Increasing Interval(s):

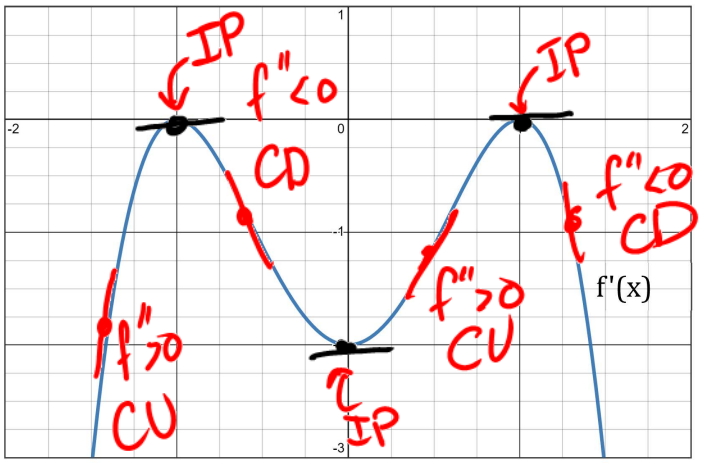
(c.) Decreasing Interval(s):

(d.) Relative Maxima Occur at $x =$

(e.) Relative Minima Occur at $x =$

Question 7 of 7

The following graph shows the derivative $f'(x)$ of the function $f(x)$.



Which of the following statements is true about $f(x)$?

- $f(x)$ is increasing on $(-\infty, -1)$ and $(0, 1)$
- $f(x)$ is concave up on $(-1, 1)$.
- $f(x)$ has one relative minimum.
- $f(x)$ has two relative maxima.
- $f(x)$ has one critical number.
- $f(x)$ has three inflection points.